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AMAZING STORIES
Science Fiction

Vol. 9 MAY, 1934 No. 1

CONTENTS

Editorial

Light Wave Lengths and Light Years
T. O'Conor Sloane, Ph.D. 6

Serials

The Lost City ..... *Milton R. Peril* 10
(Serial in Three Parts—Part One)

Terror Out of Space ..... *H. Haverstock Hill* 54
(Serial in Four Parts—Conclusion)

Measuring a Meridian ..... *Jules Verne* 107
(Serial in Three Parts—Part One)

Science Questionnaire

(What Do You Know?) 42

Stories Complete in This Issue

The Ultra-Gamma Wave ..... *D. E. Winstead, M.D.* 43

Dr. Grimshaw's Sanitarium ..... *Fletcher Pratt* 79

The White Dwarf ..... *J. Lewis Burtt* 91

Poem

A Dream ..... *Edward Reid* 90

In the Realm of Books ..... *C. A. Brandt* 134

Discussions 135

Our Cover

represents Jules Verne's monument in Nantes, France. He was one of the founders of the school of Science Fiction, which in late years has been acquiring a place in our literature—Drawn by Morey

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THE MAGAZINE OF SCIENCE FICTION

VOLUME 9

May, 1934
No. 1

T. O'CONOR SLOANE, Ph.D., *Editor*
Editorial and General Offices: 222 West 39th Street, New York, N. Y.

Extravagant Fiction Today . . . . . Cold Fact Tomorrow

Light Wave Lengths and Light Years

By T. O'CONOR SLOANE, Ph.D.

MAN, living on this little sphere of our solar system, thinks that it is of enough importance to be the basis for describing the whole universe. The earth, as our readers know, has its axis located by its rotations, the ends of which axis define or locate the north and south poles. If a plane is assumed to pass at right angles to the axis and through its center, and consequently through the center of the earth, it will cut our sphere into two equal proportions and will give us a circle, called the terrestrial equator, where the plane, on its emergence, is assumed to cut the surface of the sphere. This is all very simple. Now suppose the plane to be extended and to have an area large enough for all the stars in the heavens to be projected upon it, map fashion, we would have what called the celestial equator which is pictured in our minds as intersecting a great celestial sphere, just as it intersected the earth. The notion of a celestial equator assumes, or leads to, the conception of a celestial sphere or globe, large enough to contain all the heavenly bodies. This sphere is of inconceivable magnitude, and it is based upon or founded upon our altogether insignificant little earth.

What the size of the celestial sphere is we do not know. It means the volume of space containing all material things. When we think of a star cluster in the celestial sphere, which cluster is fourteen billion times more distant than the sun, we can picture the inconceivable size of the celestial sphere.

Edgar Allan Poe said that a man could not conceive the distance of one

mile stone from the next one. If you occupied your spare time counting, it would require about three months to count a million. The sun is over ninety millions of miles distant so you might work for 270 months or 22½ years to count the miles in this comparatively short, even minute, celestial distance, less than one hundred million miles. But think of counting a star cluster's distance.

With all our efforts to get into the stratosphere, only a few miles away—with our descents into the ocean's depths a few fathoms only—all such achievements are ludicrously small and trifling. We almost lose respect for our little pigmy of a solar system and for what we can do in it.

Now the planets of our system, and we do not know how many there are, if we include the asteroids, and all of which move around the sun, each in its own ellipse, which is called its orbit, by these orbits define planes, all nearly parallel to one another. The appropriately named Mercury shows the greatest divergence, and Venus, who is next in irregularity, has about one half of Mercury's departure from parallelism with the orbits of the rest of the planets. And now we come to a trouble in our work.

The earth is slightly irregular in shape, it has mountains and oceans and owing to these and to the equatorial diameter being larger than the polar diameter, and the changing ocean tides, its polar axis keeps shifting around virtually describing closed curves, one at each end of the polar axis, so that the celestial equator is in perpetual change, but to a very small amount. It takes 25,800 years for the poles of the earth to go all the way through the 360 degrees of their closed curve.

This is the famous precession (not procession) of the equinoxes. The equinoxes, meaning equal nights, are the two periods in each year when the day and night are of equal length. Their precession, as their change in occurrence is termed, is about fifty seconds of arc per annum, approximately equal to the seconds in a circle divided by the 25,800 years. If we measured one year by the constantly shifting equinoxes we would have sooner or later our July in midwinter. This of course is a sort of paradox—we really disregard the precession of the equinoxes in our ordinary life, but let it take care of itself, and use our 365-day year and 366-day leap year as the regulations of our months. And like most other things, this is not quite accurate.

So we have to use a basis formulated definitely on our own little earth, a planet less than one hundredth the diameter of the sun, and less than one millionth of its volume. If we could pour a succession of earths into one great body, it might be supposed to take months to attain the volume of the sun. In approximate figures, if an "earth" were added every second, it would require over ten days to build up a mass equal in volume to the sun.

We have now to picture to ourselves the great sphere holding all the stars of the heavens. So we imagine the plane of the celestial equator passing through the center of the earth at right angles to its axis. This gives us the imaginary circle girdling our planet, the earth's equator, passing through Brazil and Equador, on our hemisphere, the latter country deriving its name from it. As far as the earth is concerned, its equator is fixed. But owing to the precession of the equinoxes the celestial equator has a slight shifting which the terrestrial equator also has, if referred to the celestial sphere. If we left the celestial sphere out of the reckoning, we might forget the precession of the equinoxes. If the reader has followed all this, he will see

that the celestial equator lies in the imaginary plane at right angles to the earth's diameter and has the center of our globe for its own center. The center of the earth is the center of the universe. But our equator is in perpetual change and the celestial equator also as we have seen. The saving clause is that the motion is very slow, and the starting point of the motion is reached eventually, so that it is a closed curve that is followed, and it takes nearly 26,000 years to complete the precession and start a new one. The period is called the Platonic year.

It is perfectly fair to say that celestial distances are but little realized. They are beyond human conception. Our earth is nearly 93,000,000 miles from the sun. Every high school pupil can come out with that bit of information. But celestial distances are so great that except for our little solar system, miles do not figure. To attempt to use miles would be like measuring the width of our continent in thousandths of an inch.

The light-second is familiar to most of us in its meaning, even if we do not carry its mileage in our minds. It is equal to the distance light travels in one second. The distance from the earth to the sun in light seconds is found by dividing about ninety-two million miles by 186,000 giving nearly five hundred light seconds.

This distance is trivial. Think of a light year, 186,000 miles for each second of that period. Try the multiplication and you will obtain, if you make no mistake, nearly six trillion miles—(six millions of millions) of miles. But nothing outside of the solar system is as near as that. A star on the very threshold of the heavens, the nearest star, is about 4.27 times as far from us as that. It is 4.27 light-years distant. How long would it take to count those miles?

The simplest and most obvious method of measuring the distance from the observer of an inaccessible object is by triangulation. A base line, whose length has to be accurately known, is measured off and from its ends the angles with the base of the lines pointing at the object are measured. From these data a simple calculation tells how far off the object is. Suppose now that this method is to be applied to find how many miles distant a star is. The diameter of the earth is far too small, so the diameter of its orbit is used. Two observations of the star are taken six months apart. This gives a base line of over 184 millions of miles. Yet the stars are so remote that there are only a few to which this method can be applied.

A very curious ratio gives the relative distances of the planets Venus, Mars and Mercury compared with those of the nearest stars. The stars in question, five in number, are each about one million times more distant from us than the planets Venus, Mars and Mercury respectively are distant from the earth at their nearest approaches. Thus the nearest star in the heavens is *Proxima Centauri*, 4.27 light years or 25 trillion miles distant, almost one million times more distant than Venus. If we could reach it by wireless it would take over four and a quarter years for our message to get to it. Similar coincidences apply to a few other stars referred to Mercury and Mars respectively, the same factor, one million, applying to them. The distance of a star from the earth was first measured in the year 1838, nearly a century ago.

As the slight irregularities of the earth's shape change the relation of the equinoxes to the constellations in the celestial vault, they have another very practical effect which is alluded to in the story by Jules Verne, which begins in this month. As a unit of measurement the French decided to use a frac-

tion of the circumference of the earth. So they set to work to determine the length of the line which would encompass the earth from pole to pole. Then having, as they believed, effected this measurement and correcting it for equatorial bulge and polar depressions, a fraction of its length was taken as the unit of length. The meter or metre is the name of this unit in English, and it was defined as one forty millionth part of the circumference of the earth through the poles.

It was here that an error came in. The measurement of a part of the meridian, which latter is the polar circumference of the earth, is affected by many irregularities and the work of the astronomers and their staff in executing the measurement was not absolutely accurate. So the meter, which is now a legal measurement, and which is invariable, is really the distance between two marks on a standard platinum alloy bar at the temperature of melting ice. The bar is kept in Paris with the most minute details of care for its preservation to keep it intact and unchanging.

The effort to obtain a natural standard of length failed, as subsequent measurements of the meridian have given other results, it being assumed that the more recent measurements are ever more and more accurate.

It is quite interesting to read accounts of the methods employed in the work. A base had to be directly measured by rods, with due regard for and with corrections for temperature. Then from this and other base lines a simple (in theory) triangulation gave a part of the meridian, the base line being off to one side. But in the practical measuring of lengths and in getting angular relations, refinements innumerable had to be employed.

The attempt to obtain a truly scientific meter based on a natural dimension failed at first. But the measurement of the length of light waves has given the meter in Paris a definite relation to a natural linear quantity. The length of the Paris meter is known with great accuracy, as referred to the wave length of a specified light.

In the early days of the last century the wave theory or undulatory theory of light was decidedly inchoate. Huygens had done some work on it and Thomas Young developed the theory to quite a high degree. But the length of a light wave of specific position on the spectrum was yet to be determined. The spectroscope has enabled any such wave to be specified and the wave corresponding to the red line in the spectrum of the metal cadmium was selected.

The centimeter is a little less than four tenths of an inch in length (.3937). The wave-length of the red line in the spectrum of the metal cadmium was determined. It is 6,438 one hundred millionths of a centimeter (the Angstrom unit). And this minute length-unit is really the basis of all measurements, even of the most distant bodies in the heavens. It is the unit of length which specifies the length of the platinum-iridium alloy meter preserved with rigorous care in Paris. Compare the length of this light wave to the length of the light year.

THE END

The Lost City

By MILTON R. PERIL

Serial in 3 Parts—Part I

This is not the first story which we have published with an Egyptian mise en scène. *It leads to a very astonishing series of events, based in a degree upon the great Sphinx that asked the riddle famous in the history of ages. It holds one's attention and really preaches a sort of sermon, yet has quite a bit of excitement. Mr. Peril is a new author as far as our readers are concerned.*

Illustrated by MOREY

CHAPTER I

The Manuscript

EL KASR is one of those ancient spots on the face of the earth that strives to acclimate itself with each fleeting generation. Its narrow and cobbled streets have been polished through the ages by the countless bare feet of the natives, who have long since returned to the dust of their creation. Only its slumbering eye can flash forth what it has seen, incoherent and indistinguishable. Yet, to one who can understand it, it speaks with astonishing and clarifying thought.

To Sir John Mansfield, the eminent archaeologist and Egyptologist, El Kasr was one place that held him spellbound, one effort of falling and rising civilization which spoke itself plainly to him. It was in his blood, those centuries-old dwellings of masonry, which squatted against a slithering desert to protect the pliable and susceptive body of man from the oppressive heat of the overhead sun. It was an answer to the constant quests of his mind, this arid sand of Egypt.

Years he had spent upon it, in it, trying, from the pieces he detached from its bosom, to set together those drifts of understanding into one orderly unit of human knowledge. And throughout the successive years his heart had not stifled one bit the thrill of discovery; rather, as the days rolled by, the more acute became his sense of desire. He knew Egypt; knew what potent powers it contained in its breast; knew what tremendous part it had played in the shaping up of the ensuing generations.

Yet, El Kasr was to him something indefinably clear. When his feet clicked against the hot and dusty stones, when his lungs breathed deeply of the afternoon atmosphere, it was almost as though he were transported back through the ages on some mental, invisible breath. Sun-baked was the land. But the very essence of material crumbling manifested the lurking mysteries! And the mysteries of this land—that feature quickened his blood!

THE dirty figure of a dried and twisted man lounged on the corner of a shabby thoroughfare this late afternoon, his glistening, dotty eyes glued on

The torch fell upon the inscribed walls and he soon forgot everything about him. His scientific sense prevailed and he stood there for the better part of an hour studying those writings.

Mansfield's aimless ambling. His hand was beneath his tunic, a torn, greasy garment which accentuated his native disreputableness. Somehow, the scientist couldn't keep his eye off him. There was something faintly familiar about the fellow, but he couldn't place him. Probably he had seen him in El Kasr before; Mansfield was well known here.

The tall Englishman strolled slowly down to the intersection. Long seasons in the land had made him practically immune to the constant crush of the African sun. His healthy and tanned body had long overcome the discomforts of the brow-beating solar rays. The native on the corner left his lounging position and made for him.

This spot in El Kasr was noted for its ill-omened and gristly, evil characters, but Sir John had gone through it many times. Yet there was something about the advancing man that made him hesitate, and he clutched the stout stick in his hand more tightly. The manner in which the shabby fellow concealed his hand under the cloth of his tunic was mysteriously ominous.

Sir John whirled upon him, half-raising his cane. "What the devil do you mean by sneaking up on me like that?"

The other shrunk, his bony, discolored hand rising before him.

"PEACE!" he whimpered, dropping still farther away. "I attempt no harm. Rather I come with good fortune for you." His right hand still remained under his tattered tunic.

"What good fortune could you bring?" Mansfield snapped at him in wonderment, eyeing the slinking fellow from head to foot.

"Please, Sir John. Don't you remember me? I'm Horda!"

The Englishman stared at him. Somewhere he had seen this man, that he was positive. But his name brought to him no connecting identification.

"Don't you know me, Sir John? I was with you in the Libyan desert excavations five years ago!"

Then it flashed through him. He was Horda el Abrim, the man who had been in charge of the motley group of men who had assisted him at that time. Mansfield softened somewhat as he took in the other's sad condition. What a metamorphosis in the man! He recalled Horda as being a stalwart, lean fellow. And this—— Probably, he mused, it was because he had found no other employment since then. Work was scarce in this land for one of Horda's type.

"So it's you, Horda?" he laughed. "You've changed. Well, why are you stealing up to me like that? Don't you know it is rather unhealthy?"

The dirty man opened his mouth in a grin, his yellow and rotten teeth protruding like fangs. He drew up closer and snatched out his hand. His fingers held something bulky.

"Well?"

Horda looked around cautiously, extended his hand. "Look at this, Sir John. I know you will be interested in it. Saved it for you. Maybe you can give me something for it?"

The sun of the dying afternoon glanced off the enlarged bones of his twisted hand. Gnarled and caked they were.

"What is it?" he demanded, taking the bundle.

The native shook his head. "Something old. Something you might give a few pounds for."

It was wrapped and secured with heavy twine, into an inordinate mass of stiff paper. He couldn't make it out.

Horda wheedled: "Come to the shop on the corner. There is another one of those there. You can take it apart and look at it. And then maybe you'll give——"

Sir John Mansfield pattered after him, holding ready his heavy stick. No telling how this might turn out, he told himself. It might be a trap of some sort. These desperately needy characters down here might do anything to secure a few pounds.

At the corner they turned down beside a squatty, one-story building and Horda nodded at it. Prodding him forward, Mansfield followed down a littered flight of stone steps, picking himself in and out of the strewn, reeking débris. Horda pushed aside a filthy covering which served as a door and bade the scientist enter.

Mansfield glided in. The interior was a maze of shadows, no window to the entire place, and were it not for the flickering lamp upon the table in the corner it would have been a worthy hole for ambush. He crouched against the wall, sweeping the place with a quick, penetrative scrutiny.

In one corner leaned a three-legged table which had once consisted of four extremities; its top was shoved into a crevice in the wall to keep it on an even keel. The floor was without adornment of any kind save for more débris; the walls were bare of everything but ghostly shadows. Upon the table, however, was heaped a pile of odds and ends of every description.

WHAT surprised the Englishman was the nondescript figure of a white man slouched in a small ramshackly chair near the table. His face was covered with a straggly, frizzy beard and in his hand, as though just taking it away from his lips, reposed a bottle.

He blew a volume of odious breath from him, perhaps bent upon craftily neutralizing the stench already contained in the chamber, and grinned.

"Welcome, Sir John Mansfield." His throat emitted a hollow laugh.

The scientist grasped his stick and raised it. There was something strange about all this, and the last thing he intended to do was to let himself be hoodwinked and caught unaware!

But the white man only sank deeper into the seat and dropped his head back for another swig at the bottle. It came away from his mouth to the accompaniment of deep, contented sighs. His hairy arm served as an efficient wiper. Bloated, leering eyes fixed on Mansfield.

"Need not worry, Sir John, need not worry! No danger here!" He coughed suddenly and it grew in intensity, rising deep from within his breast, until his inflated countenance was obscured by a purplish tinge. "No—no danger!"

Mansfield regarded him closely. It was easy to see that the fellow was on his last resources. That cough predicted a final stage of lung deterioration, and, from the manner in which he swung the bottle again and again to his lips, it seemed to be a powerful deadening influence. Probably some renegade, this chap. It wasn't the first one the Englishman had seen succumb to the merciless sun of the continent. It got them in the end. The windowless room was evidence of his fanatic desire for sunless days and nights.

The fellow wheezed, "Horda heard you were in town. Said he was going to look you up. He—we got something here we know is in your line. Had it for a long time, want to get rid of it now. Got to get some money. Can't get whiskey 'n' rum for nothing, you know!" He burst into a cackle.

Mansfield went closer. "What is this thing you have? His eyes didn't leave either man.

The man of the bottle started to rise but halted. He turned to the table beside him and extracted from the disorderly stuff another bundle of paper

wrapped with cord. It was similar to the one the scientist held.

"Here's the mate to the batch you got now!" Sir John caught it as it was flung to him, curiosity aroused, stepped into the feeble glare of the lamp and bent down, loosening the twine. He glared at the first sheet.

SIR JOHN MANSFIELD knew the thrill of discovery. His vast experience had thrown many thrills his way. There was the time, for instance, when he had been the first man to enter the twenty century old tomb of a Pharaoh of which little or nothing had ever been gleaned, and he had found the sarcophagus chamber just as though its contents had been put there yesterday. Prowling, maudlin vandals had not come upon this. The hieratic scripts were present in all their invaluable glory. That, indeed, had been a thrill!

But as Mansfield's eyes scanned the paper before him, under the pale illumination, an odd shiver crept down his spine. He couldn't diagnose the peculiar feeling. Long association with papyrus of the ancient Egyptians had sensitized his fingers; there was something about this odd grain which seemed to leap through his nerve centers electrically.

This faded papyrus which he hold now was old—old! Old! The knowledge kept ringing through his brain like a clanging spirit. His hot eyes were intent upon the small characters inscribed thereon. The treacherous light gave him no assistance, and he heaped an epithet upon it. Hastily he tore the cord from the other bundle, his pulse quickening. Both were of the same material!

"Interesting—no?" broke in the scattered voice of the white man.

Mansfield shuffled the sheets. They were all hard and stiff with the weight of ages. In many places the paper had cracked and fallen away; time also had wrecked its toll and had faded large portions of the picture-writing. But the Englishman gnashed his teeth at the atrocious light. The fluttering shadows ridiculed every attempt to decipher anything!

He straightened up abruptly, assembling again the manuscript, carefully entwining the pages with the cord.

"Might be worth a couple of pounds, maybe?" the fellow sleazed greedily. "Or maybe ten—twenty—fifty?"

Mansfield glared at Horda and the decrepit man in the chair. "Where did you get this?" he questioned slowly.

"Anything's fair in this man's country," the white man spat mirthlessly. "Dead man's graves carry things—things which people like to have."

"You mean it was taken from some tomb——"

"A man has to live, Sir John," Horda interrupted. "What is the difference?"

Mansfield considered the situation carefully. He didn't know as yet what matter of importance the manuscript contained, if any. But if an inherent feeling meant anything, if ever his heart had dictated an intuition, this script was something out of the ordinary. Still, he was a scientist to the core. He must know from whence this came. Already he gathered that these men had somehow plundered a tomb. There was a severe penalty for breaking into the sand-sealed burial grounds of centuries' existence. It was his duty as an Egyptologist, respected by the Egyptian government, to abide by its law and enforce it.

BUT the two men wouldn't talk. He threatened them, cajoled them, and once even stalked to the door with the bundles under his arm, to go to the proper authorities, but the white fellow angrily drew forth a pistol and pointed it at him. Mansfield perceived what highly strung impulses he was dealing

with. The white man was crazed for the need of liquor; he'd get it through any means.

The bloated face loomed hideously in the shadowy gloom. The weapon was distorted until it appeared as large as a small cannon. He croaked: "You know it's valuable. I need money. Fair exchange. Come across!"

"How much?" Mansfield's mouth said grimly.

The tone of the other changed. "Only just enough to keep some life in a body. I'm not a criminal!"

The Englishman smiled wryly, shoving the manuscript into the sack pocket of his coat. He removed his wallet. He could do nothing else but acquiesce. Carefully he detached two ten pound notes.

"Here, Horda. Dole it out bit by bit so you don't drown the rascal." The native's eyes glistened at the sight of the money. Mansfield made for the door, swinging his stick vigorously; at the threshold he paused.

"In all probability this will find its way into the government's hands. When it does, you scoundrels beware! It will hound you to death!"

He brushed aside the grimy curtain which bore evidence of being the door, and departed. Outside, his feet carried him at a running pace to his lodgings.

CHAPTER II

The Revelation

IN his room he tossed aside the cane, yanked down the blinds and turned on full the lights. His pulse throbbed as he drew forth the manuscript and tenderly placed it upon the table. For a moment he was almost afraid to look at the sheets lest his enthusiasm be rudely jolted. Why did he feel this way about this unknown writing? What made him believe that it might be something of value? Was it his instinctive touch—the touch of one who had delved in such matters for years? Did this give him inalienable right to rely upon his feelings?

He secured a magnifying glass and dropped upon the chair. He took the first sheet, spread it smooth and leaned over it. For a good five minutes he studied the hieroglyphs; then his brow furrowed into a frown. There was something strange here! Was it a jest of some sort directed toward him? Was a hoax being attempted?

His eyes dropped upon the paper once more in an intense scrutiny of the inscriptions. Presently he took another sheet of the papyrus. His eyes grew wide. Great heavens! His blood slowed down; such a thing was almost unbelievable!

Sir John Mansfield was one of the greatest of living Egyptologists; head of the Archaeology Department at Oxford; an authority unexcelled on the written word and lives of peoples long gone—specifically of those who had dwelled and pulsated through the land of Egypt centuries before. Any debate or argument on hieroglyphic, hieratic or demotic writing which could not be fully and justifiably answered, was tendered to him. It was a passion with him and the world of science knew and respected his knowledge.

Every scientist is suffused by an undercurrent of hope that at some time he will pierce the gloom and bring out a discovery which will obscure all others. But a true undeviating scientist, faced with that discovery, will pit it against every conceivable test for any possible weakness.

And that is what Mansfield did. He couldn't admit to himself that this manuscript was deceiving. No! He subjected it relentlessly to every examination his

scientific knowledge knew, to bring out the possible fraudulent character. The paper itself underwent a microscopic scanning. Through the hours of the night he labored tirelessly, anxiously.

Dawn was creeping around the borders of the window blinds when he arrived at the foregone conclusion that no living hand could have constructed the manuscript before him. No—and no hand within the past thousand years! The script was genuine, solemnly the evidence of intrinsic truth.

Beside him lay the littered sheets of his own handwriting, scribbled as he had deciphered the manuscript. Through the process he had worked slowly and painstakingly. The full interpretation was not yet evident, owing to the many sheets which were faded and not legible. But now he gathered together the notes and pieced them into an understandable whole.

Suddenly, with the realization before him, his body grew cold!

THE document was written about 2800-2700 B. C., the period corresponding with the reign of Cheops, one of the mighty Pharaohs of Egypt. But the thing, that made Sir John Mansfield's blood turn to ice, was the indisputable fact that the manuscript before him had not been written by a scribe of that period, not by some educated person, but by the majestic figure, the superciliously royal fingers of Cheops himself!

The knowledge in itself was enough to make him fall back in his chair and stare stupidly at the wall. It was unbelievable! But it was authentic ! His eye saw that!

Within a half hour he had read and re-read everything he had written, and then his mind seemed to swell with the importance of the discovery. It was stupendous! Rapt eyes perused the information gleaned. Condensed, it read thus:

"I, Cheops, ruler of the mightiest land, put this down on record. Only I know the contents and existence of it. But I must get it down, so that posterity, should it succeed in locating my tomb, will understand. It will be put near my sarcophagus in a hermetically sealed container.

"It was during a summer night that there was ushered into my presence a white man of great handsomeness, who desired private talk with me. I took him into the inner room behind the throne and he revealed an astonishing tale. He claimed that he was from the city of Atlantis!

"Now I know, as do my scientists, that Atlantis is but a myth. I therefore became indignant at being secluded with a man insane, and was on the verge of calling for my executioner. But he rose to his feet, a powerfully imposing figure. He wanted only to be proven! I took one guard with me and followed him, being led to the outskirts of the city, out upon the desert. There I envisioned a gash in the earth. And standing nearby was another man, tall and well-built.

"The hole was an entrance of some sort and shortly we descended, and it took us to a vast domain underneath. It was with abated breath that—— (A great portion of the script hereafter was faded.)

"The friendship between the rulers of Atlantis and myself continued. Not one soul above knew of the existence of the lost race. The guard who followed me I had executed for conspiracy.

"In order to conceal the entrance I ordered the construction of a massive edifice and image which would stand over the descent. It was a giant statue of a reposing body of an animal with a human head! In it I embodied Silence—one who knew everything and said nothing! So that it would not bring attention I caused to be made all over my dominion

other massivities of solid rock, many in pyramidical shapes.

"There is only one entrance. All others are false. To get in, one must get under the square slab directly under the face and mouth. A stout, flat knife must be driven in between the third and fourth slabs until you feel a vibration. Then you must hasten with speed to the right paw and insert the knife under the slab at the farthest end. The huge mass of rock will slide gently back, displaying the entrance for a few moments.

"From there the signs will lead you on the only route to the city of Atlantis——".

IT was some time before he finally digested the information thus divulged. For years he had been one of the most indefatigable of workers trying to secure some archaeological clues concerning the supposed Atlantis. Legend had it that a highly civilized race once dwelt on a vast extension of land supposedly off Africa, where now the Atlantic Ocean rolls majestically on. It was thought that some cataclysmic disturbance of the earth at that point had submerged the land of Atlantis beneath the waters of the great ocean. Some scientists had asserted the belief that Atlantis had been a body of land existing between Africa and South America without interruption, and that, upon its being submerged, it had left a portion of its civilization upon the American continent. Evidence of the belief was cited in the Aztecs, the Incas.

Be that as it may, however, Mansfield had never secured anything of positive nature upon which to build a theory. But this seemed to be something very different. Atlantis underneath the Sahara desert? How could that be? It sounded preposterous. Yet, the very handwriting of Cheops himself had asserted the point clearly. After having existed for almost five thousand years this manuscript, mellowed with age, would be indeed farcical if it were anything but the truth! Sir John Mansfield shook his head abstractedly, his heart whispering that it couldn't be a travesty on a scientific hope.

And then there was the mystery of the mammoth Sphinx, which had never been solved. This fine piece of ancient art and man power had long been a source of wonder to humanity. There had never been any reason found, which could explain the great thing of rock and masonry upon the wastes of the desert; no explanation for the pyramid erections. And such an answer as propounded in this ancient Egyptian script appeared plausible now.

But Mansfield wasn't one to jump at conclusions and let enthusiasm run amuck. He rose from his chair and paced the room nervously, going over every link, seeking flaws. At intervals he would turn abruptly and stare at the table laden with the papyrus and notes to make sure that it was not a dream. With every passing moment his blood seeped through the shackles of restraint.

The picture of the Great Sphinx rose up before him clearly and he studied it mentally. Time and again he had gone around it, and once he had even been up and over it. But now, aware of its potency and meaning, he sought to bring together all threads of information concerning it, which he knew.

THE squatting figure of Gizeh was carved out of solid rock excepting the paws, which were constructed of masonry; and was 150 feet long, its head being 30 feet in length. The ever-shifting sands of the desert had constantly sought to cower this mute creature and it had been a watchful job on the part of the Egyptians to keep the image from being obscured. Its face, though, had been mutilated vandalously by the super-

stitious Arabs who used it as a target for their rifles.

Why hadn't the entrance been discovered before? he wondered. He recalled the time when an American expedition had commented on a rumbling sound. No explanation had been forthcoming for that unknown noise, and as Sir John Mansfield thought of the manuscript of Cheops, he realized that in some manner one of the men must have hit the right spot under the face. What brink of discovery he had stood upon! And had walked away!

With shaking hands he bound the manuscript in oilskin, then dropped on the bed for a short sleep. When he arose he was wide awake and he gathered together his belongings. The fever of exploration was once more rising within him. He felt that anything else he would do would only rasp on his nerves.

CHAPTER III

The Great Sphinx

IN Cairo he stopped at a hotel where he was well known, and to the manager he entrusted the safe-keeping of the oilskin-wrapped manuscript to be kept until it was called for. But nothing did he make known of the value of its contents.

It was a clear and star-bejeweled night when Mansfield moved around the Great Sphinx. His every movement threw shadows over the sandy blanket that gleamed dully and stretched away from the rock image into the abysmal void of night. He was garbed in khaki breeches and shirt. A revolver and a belt of cartridges were at his waist—for what reason he had taken these he couldn't tell, but he felt safer with them upon his person. Several electric torches were stuffed into his pockets, with an unlit one in his hand.

The movement in the slithering sand was precarious and he had to walk around cautiously. At one of the massive paws he paused, clutching the weather-beaten masonry to steady himself. Keen eyes inspected the distance to the main body from the outstretched pair of reposing legs, before he let himself into the rift.

The shaft of his now-lit torch swept the darkness of the shaded rocky breast and he proceeded slowly toward the upflung mass of stone. From his belt he drew forth one of two long steely knives. Directly under the stern and set visage of the immobile animal he threw the light around.

The instructions of the manuscript were clear. He was to get under the face. Between the third and fourth slabs of rock he must wedge the knife until some response was got. The torch illumined the slabs and defined every crack in them clearly. But he was undecided where to begin. Time had forced itself too manifestly upon them. There were cracks and cracks, some of them extending from side to side, wide and deep, which had been formed long after the huge animal of stone had been put into impassive, inanimate existence.

He scrutinized the massive slabs with a sharp eye, until he felt that he could discern the original separations of the rock. They, too, seemed to have wilted and widened with age. Reaching a decision, he inserted the knife into one of the cracks, used it as a probe to discover its possible depth, and waited. But nothing happened.

For a long while he repeated the process at each split of the rock, running the blade back and forth. Often, the end of the knife could not begin to probe the cavity which extended to an unfeelable depth, and the repeated failures irked him. But he couldn't let that indomitable urge within him succumb. He kept at it.

The writing of Cheops was imprinted lucidly upon his brain. "Right under the face," it said. And right under the face he tried again and again. Between the third and fourth slabs! Crevice after crevice felt the blade of his knife; it was tedious and with no result.

His reoccupation suddenly snapped from its lethargy as he felt the blade in his hand fall into a well-defined groove. The thin steel clicked into something! Something seemed to whisper to him that he had found the objective. With nerves that couldn't be held from prickling into irresistible exaltation, he turned away for a moment. No use getting unduly enthusiastic over this, he reasoned. He must work slowly, carefully, examine everything properly.

Again, and with utmost attention, he slipped the instrument deep. Sure enough the point of the blade fell into the groove again! Then, with a stifled breath, he started to slide the knife along the crack!

For about a foot it went smoothly, his eyes fixed upon the moving handle; then, with the same abruptness, it came to an obstruction with a stop! His face fell. Surely, this wasn't one of those false leads! Back and again he moved the blade, with the same results.

Finally, with baffled rage at hitting the end of the groove as often as he had, he slammed the blade violently against it. It was all so misleading. And then it happened!

As the knife struck the hidden barrier with force, something seemed to give way. His heart almost stopped beating. There was a slight movement from within the breast of the Sphinx! And then a hum grew in intensity, a low whirring noise which to him was a tolling, clanging ring of the dawn of success. He had found it! He had found it!

It held him breathless; he gaped at the hole in front of him, his hair whirling madly. As long as the reverberation continued, he stared stupidly at the rock. But soon it died away with a flutter and his countenance snapped back to normal. The manuscript flashed through his mind. This was but a part of the procedure. Distinctly he remembered that he must run toward the paw while the whir was still loud! He jammed the blade into the groove again and like heavenly music the grating sound beat on his ears.

He ran and stumbled through the sand, to the stretched paw of the creature, but as he reached there the noise died softly away. He paid little attention to it, however, seeking the farthest end of the leg and feeling around it for an opening through which to slide the knife. This time he worked with fierce purpose; already he knew that he would find it somewhere; it would be only a matter of time until he struck the right spot.

The masonry of the paw confronted him with the same handicap the broad breast had. Fissures and fissures! He disregarded the crumbling holes in the stone which were not man-made and sought a thin line which might be the joining of two rocks. And he found it! Ordinarily it would have meant nothing, the insertion of the blade into that perfect groove and its sudden stop at some hindrance, but with a snap of his wrist he heard an empty click and knew that it spoke volumes for him.

But he didn't return immediately to the gloomy spot beneath the breast. He threw the beam of his light toward it, speculatively measuring the distance from paw to main body, figuring the speed he would have to make to work both ends in time. The main whirring, he had discovered, continued uninterruptedly for about twenty seconds and during that period, he figured, he must have enough time to dash toward the paw.

So he returned, started the reverbera-

tion anew and ran pell-mell in a straight line. The unsteady sand under his feet slopped against his soles, retarding him, but he threw himself onward, stumbling, forcing his way. In a split second he located the groove and jabbed the blade into it and shoved hard. The purring sound suddenly rose in volume to a high pitch. He watched everything about him breathlessly, his electric light playing brilliantly upon the massive paw.

The two slabs nearest him began to slide back ever so slowly, like a vast door to a vault, noiselessly!

There, before him, yawned a black pit and, as his torch flashed into it, he suddenly perceived that the slabs were starting to move back again. It galvanized him into action! He leaped into the hole, felt his feet strike a pair of stone steps—and then the huge portal closed upon his back!

Everything had occurred so spontaneously that he didn't have time to regard the consequences once he was inside, with the opening closed. It all came to him now as he stood within the Great Sphinx, his light playing upon the flight of steps, and he whirled upon the great door with his torch. The rays struck the barrier to freedom and bounded back at him with a sardonic chuckle, or so it seemed to him. There was nothing upon it which might be construed as a key for this exit. The only thing he saw was the hieroglyphic inscriptions which lined the wall!

He shoved and pushed but there was no result. Just as surely as if he had entered his own tomb alive, was he incarcerated here. For a moment his attempts became frenzied, then he laughed. Here he had hoped beyond hope to find an entrance to get in; now, that he was in, he was trying to get out!

He murmured with a chuckle to himself, "Afraid?"

THE torch fell upon the inscribed walls and he soon forgot everything about him. His scientific sense prevailed, and he stood there for the better part of an hour studying those writings, making out the pictures. He sent the beam down the steps and saw that as far as he could look the walls on all sides were marked. The place was chock full of the history of Egypt up to the time of Cheops! What a find! What a find!

His scientific mind swelled with the knowledge. What a sensation this would create when it would be made known! What first-hand information was contained here! For a short moment it seemed unreal to him—but there it was! It was overwhelming!

Under ordinary conditions he would have sat down, note-book and pencil in hand, forgot his environment for many hours, but he couldn't do this now. The steps went downward, straight away from him. He didn't know where he was at the present time. The hieroglyphs wouldn't run away. The thing to do was to proceed.

The place was dry, dreadfully dry and dusty; breathing was hard. Below his feet was an accumulation of dust an inch thick and each step of his shot particles into the air. Soon he was sneezing and gasping for breath. And it got no better as he advanced. Rubbing his smarting eyes, he walked smack into a blank wall! It was at the bottom of the steps, at the end of the sloping corridor!

He flashed his light upward and met the blank musty stare of the stone roof atop. For a prowling moment he wondered whether this was one of those false headings Cheops had warned against. If it were, he shivered, it wouldn't help him any! That portal back there leered at him with sardonic staunchness!

But it couldn't be, he told himself. He had followed the ancient Pharaoh's instructions to the letter; this could be the

only way. There must be some way of getting out. Two openless walls stared back at him, fore and aft. Slowly he retraced his steps until he once more stood at the barred opening, and minutely went over the walls and steps, trying with the knife which he had left in his belt—the other sticking outside in the groove—to find some crevice which might be the key to it all. But he was unsuccessful. His lungs were beginning to pant, straining from the airless tunnel. Gradually he worked his way back to the other end of the sealed passage. Suddenly he flung himself backward with a cry and a shudder!

His light was fixed upon an object he had overlooked, which lay in the corner. It was the desiccated body of what had once been a human being! He bent over it. Curiously, as he touched it, it didn't fall apart as rapidly as he thought it might, though the garment which clothed it crumbled up into fine dust! Its features were indistinguishable. Somehow this fellow had entered this approach and had been unable to proceed any farther! He had perished like a rodent in a closed box!

THE realization of that sent a prickly sweat over his body. The dire predicament which Mansfield had unfolded upon himself now lanced him every time he glanced at the thing at his feet. There was no exit from here. He, Sir John Mansfield, must perish in this hole just as this man had! It was inevitable. That sly old scoundrel of a Cheops had simply concocted the story of Atlantis, so that he might maintain some earthly power after his death!

It was a hard thing to bear. Mansfield gnashed his teeth in rage. No! He wasn't going to take this as final. Cheops couldn't be so cruel! There must be some way out of this. There had to be! This was—horrible!

The manuscript—what did it say? Every word was etched on his brain. "The signs will lead——" What signs? The Englishman's eyes were shot with grimness. He clutched his breast; it was becoming harder to breathe with each inhalation.

It was a miracle, an answer to his unuttered prayer, that turned his eyes upon a spot on the blank wall, a place he had somehow overlooked. His struggling heart leaped at the sight of a fine slit upon it; next to it, somewhat obscured, was an arrow which pointed toward it. The knife reached madly for it, the blade quivering as it stuck in the hole.

The next moment there was another of those soft rumbles! And the blank wall swayed gently as though on a pivot, moving back upon an axle!

A genuine burst of relief fell from his gasping throat as a current of fresh air flowed into the passage. Mansfield leaped through the entrance, looking back with sympathy at the figure which lay upon the floor, and the door swung shut.

He didn't need to tell himself that he would have perished had he been forced to remain much longer in there. His lungs expanded to a delightful freshness that brought new life. This new chamber was not like the sealed one he had just quit; somewhere there crept through into it a stream of fresh air!

CHAPTER IV

The Priceless Vault

THE literary remains of ancient Egypt consist of papyrus manuscripts, sculptures and tablets found in tombs, temples and ruins. But the earliest characters used by these ancient people were the hieroglyphic inscriptions. Practically the earliest ones date as far back as twenty-five centuries before Christ. There had long been dif-

ficulty in reading those ancient symbols, but the fortunate find in the year 1799 of the Rosetta Stone, in the Rosetta delta of the Nile river, furnished the key for the unlocking of these treasures. The Rosetta Stone contained the equivalent inscriptions in hieroglyphics and in Greek letters; the meaning of the Greek being known, the symbols were possible of translation.

As Sir John Mansfield stood in this large room, his light picked out upon the walls a complete history that dated back further than any present day knowledge of the ancient land. The walls of the chamber gave an indelible print of a detailed recounting of human lives! It was far more valuable than any he had yet seen. Almost thirty centuries before Christ this had been written, and it contained data of centuries before that period! Happenings that meant more to archaeological science than anything else!——

It was impossible to evade it. Silently his feet carried him around the four huge walls and the electric torch was flung up and down, lighting up the clear-cut writings. Time meant nothing to him now; hunger was a thing non-existent. From somewhere there circulated a thin breeze which assuaged his desire for water.

At every digestion of the knowledge confronted, he marveled at the many discrepancies which beset the twentieth century science. And this was authentically conclusive; nobody on earth would dare defy what was written hereon! Imagine what this meant, he exulted. And it was hours before he could calm himself down to face the situation at hand, though he felt he could stay with this lore always.

The chamber though vastly high at one end, turned out to be about twenty feet each way in rectangular shape. At one end the ceiling tapered down until it was only about ten feet from the ground. The current of air came from somewhere, he reasoned; it wouldn't be hard to discover the source of entrance.

And then he noticed that, at the place where the ceiling came down, there were four metallic pegs in the wall, right under one another. He tried them in an effort to discover their probable intentions, shaking them, trying to loosen them from their bed in the wall. But they wouldn't come loose. Nothing moved when he hammered at them. Surely they were there for some purport, he said to himself, regarding them intently.

NEAR-BY, right upon the opening through which he had come, he pounced upon another one of those fine slits and he applied his knife, only to discover that, when the slab-door pivoted back, it burst open upon the steps he had so gratefully left.

For hours he searched diligently for the source of the air, for some slit which would guide him outward. He realized now that there was bound to be one. It only demanded his constant exploring. And many times during those hours he lost himself studying those priceless inscriptions, that redundance of treasure of mankind, and nodded his head with a smile.

It was tiring effort which kept culminating in failure. The Englishman's knees felt shaky, strange. He removed a large bandanna and wiped his brow. The shirt was soaked, for all of the circulating air. Realizing his weariness, Mansfield sat down upon the floor, relaxing against the wall with a sigh. His legs slid forward and he laid down the torch. For a moment, he decided, he'd close his eyes for a bit of rest. His arms were awfully tired . . . tired . . . .

How long he slept he didn't know. When he opened his eyes and stared blinkingly around him it was totally dark. The fog of Morpheus was just

starting to fade from his brain and he sat up with a start, glancing around frantically at his invisible surroundings. For a good ten seconds he couldn't get his bearings. Where was he? This Stygian blackness, what was it?

His hand reached out and brushed the cold rocky walls. And then it came to him from out of the eerie interment which for a moment had seemed a hideous possibility. His fingers fell upon the floor and encountered the torch. With a relief he grasped it and snapped it on. But no beam of light radiated from the battery! He had forgotten to turn it off. Truly he had slumbered many hours! The battery had burned itself out!

For a moment panic seized him, then he laughed. There were still several in his pocket! It had been a fortunate foresight which had prompted him to add those to his equipment. Quickly he took one out and clicked it on. The bright powerful beam was the prettiest thing he had ever seen. The feeling of security reverberated through his entire body.

He arose, primed for anything. Distinctly it returned to him how his efforts to escape from this chamber had been futile. There seemed to be no way out of this underground vault. If he couldn't find some opening ahead, he'd have to go back to that passageway of steps and make a final effort to get out that way.

His light flashed its way around the room, up at the ceiling. And he saw the exit as clearly as though it had been pointed out to him! He grumbled at his sightlessness; probably due to his enthusiasm over the heiroglyphs.

The ceiling, as it fell from its great height, didn't touch the top of the shortest wall! He moved away into the center of the room to get a better view. Right over the place where the four bars of metal were imbedded in the rock and about two feet over the top one, was a narrow opening. The light of his torch flashed toward it but the angle barred a clear view.

How could he get up there? Then it dawned upon him that the spikes of metal were there for that purpose! What a fool he had been! He tested the lower one by putting his whole weight upon it; it budged not a fraction of an inch. Here was the solution. It was a form of ladder.

His fist wrapped around the next rung, and, repeating this, he dragged himself to the height of the wall, carefully guarding the torch, which he had clipped to his belt. At the top he gathered himself so that he rested on the topmost rung securely, affording his arm free motion, and he lanced the small aperture with the brilliant yellow rays. It appeared large enough for him to wedge himself through, and he forced himself into it and dragged his body along. The shelf was cushioned with a heavy layer of dust which rose around him, choking him.

Crawling as he did, he couldn't help but think. If this were the form of progress which Cheops had created, then surely that great personage must have bellied along here the same as he. It was a curious form of travel, Mansfield grinned. Perhaps the royal character had desired that others prostrate themselves ignobly in some such fashion. What a humorous king of Egypt!

HE reached out to support himself for the next wriggling process, but nothing was there. Feeling around, his fingers lodged on the rim of the narrow ledge. He had come to the end! The light flared out—into space. Downward he looked, perceiving the outlines of a vast room, and right beneath him were more of the metallic bolts. He leaned out, grasped the top one, worked a leg loose behind him and dropped on the metal. In a twinkling he was down,

surveying the interior. And an exclamation fell from his lips!

The chamber was not like the cold and bare one he had slept in and just left. Its walls were streamed in gold and silver tapestries, fabric which looked as though it might have been draped resplendently a short time before. The illumination of his light brushed against it and ferreted out the brilliant and iridescent gems which were ingrained in the workings. Ruby- and amethyst- and emerald-colored stones sparkled back at him from their ancient repose, blinking at him with a new-born fire. It was a gorgeous blend of color which was cast everywhere.

In the middle of the room sprawled a long, low, ebony table piled high with dust. And upon it rested several massive chests of the same black wood. A half-dozen strangely fashioned seats squatted around the low-slung table.

He touched the fabricated walls. In the places where the tapestry was cloth he poked a hole right through. But they were few. It was mostly an artistic spinning of thready gold and silver, clinging together defying the ravages of time. It was truly a masterful piece of human ingenuity. Nothing like this had ever been found before. The tombs which dotted the Sahara desert, which spoke after countless years the incomprehensive words of yore, crushed by that very weight what artistic messages were contained within them.

The chests on the table bore the inevitable inscriptions. Cheops! Cheops! The place reeked with the fellow! Here he had inscribed what he had segregated as the best of his art; vandalism could not extend to this spot. What a foresight he had possessed!

With abated breath he threw back one of the lids. The chest was filled to the brim with fancy and beautiful objéts d'art, a craft which had never been evinced to any degree by any of the later dynasties of Egypt, or of any country. Benvenuto Cellini, the Italian master of the renaissance, would have knelt at this shrine and wept with abandon. He would have shamefacedly ground into powder his humble offerings to the world.

MANSFIELD reverently picked one article out, a small urn carved from a precious gem; and it seemed to him, as he stood there with the light focused upon it, that it quivered like a thing coming into life, a word speaking from an animate heaven! It was completely translucent, woven and cut in a golden splendor that broke into thousands of prismatic pin-points. Never had he had the pleasure of holding in his hands an object so transcendingly beautiful!

He laid it away with utmost care and inspected the other superb articles of hand-wrought sculpture. They were priceless, beyond the human craftsmanship of any living person. Museums all over the lands would have mortgaged their last asset to possess any one of these. Their monetary value—Sir John Mansfield gave it little thought. This aesthetic accumulation was too real a fact for him to think of anything else.

For the first time, a sharp pang assailed him and he sat down upon one of the odd chairs. He must have been down here for a long time. Why, he could move around here for days and days and not know the passing of time. The only thing which would bring it to him would be the emptiness of his stomach. His throat was terribly parched from the particles of dust, which had scattered from their dormant bed into his nostrils and mouth. For only one drink of cold, clear water—just one long gulp!

He glanced about the chamber which he had been the first mortal to have entered for almost five thousand years.

And at the far end he saw something dark and void-like; he stared at it keenly, leaping to his feet. Quickly he sped toward it.

It was an opening about four feet square. He got down on his knees, flashed his torch through it. There was a sloping descension. In a moment he had forced himself through, crawling, and then he swung upward the light. He could stand up! The roof was about ten feet above him.

There was nothing to keep him back now and he ran down the sharp grade. Straight down it led him, a passage that was kicked into dust as he left it behind him. Yet the current of air remained with him, coming from the unknown source; and that aided his discomfiture immeasurably. His pulse quickened as he thought of a goal near-by. Something seemed to tell him that he had left the hardest part behind him.

He stumbled upon something and paused to pick it up. It was a large gold ring, something which might have adorned a regal garment, etched in silver. Probably it had fallen from that majestic personage thousands of years ago, as he had gone through there. Mansfield dropped the ring into his shirt pocket.

The torch suddenly dimmed and gave out, and he was in total darkness again. Confound it, he said impatiently; it was supposed to possess long life. Working the button with his thumb brought forth no answer, and he tossed it from him, snatching out his last one. He'd have to make haste now, that was plain. If this torch gave out as did the others, he would be caught down in this terrifying darkness and nothing under the sun would help then. He would never be able to find the slits which worked the movable slabs. He'd just flounder around until a benign hand saw fit to take him mercifully out of life.

SWIFTLY he ran. This passage had to end somewhere. It couldn't be far. And as he fled along, his light picked out something totally dark about fifteen feet ahead, just like the open mouth of an abyss and he gasped, throwing himself back. His momentum, aided by the grade, had been such that he slid almost to the very brink of disaster, and his right leg did fall over the chasm, before his bleeding fingers managed to hold him back. His breath was coming in spasmodic gulps.

Slowly he lifted himself and reached for the torch which had fallen from his grasp. Thank God! It hadn't broken or gone out or fallen into that yawning hole!

He dropped to the edge and peered in. The sides were very smooth and they went downward to an unpenetrable depth. He couldn't make anything out. The hole was about ten feet square and was at the end of the passageway. Where to from here?

He spun the beam around the walls, feeling positive now that he knew Cheops' fondness for slits, that he would find it. And right near the pit he saw the thready arrow which pointed toward the groove! He pried the thin spot with his steel blade.

There was a sudden grinding sound, much more intense than any of those he had listened to before, but he couldn't see anything occurring. He gazed with preoccupation upon the walls, gray and unmoving. They simply stared back at him coldly under the light of his torch.

There was something moving and he whirled. Something was coming up the pit near his feet. Gradually he could make out a moving substance as it lifted toward him. It seemed to be a landing stage that was rising ever so slowly. Presently it reached the top, even with the floor of the passage, and stopped! The void was completely closed up!

His brow furrowed into a puzzle to get the meaning of this. He stood with one foot firmly on this side of the stage and braced himself, trying with the other to discover whether the top of the movable slab would bear his weight. And it did. He stamped with both feet upon it, but it didn't move. He walked around it, inspecting the wall beyond it for what might lie there, but saw nothing.

The knife was still protruding from the deep slit and he contemplated it speculatively. The thing appeared to manage everything. Maybe it would help him out now. With both feet firmly standing on the stage he reached backward and shook the blade. Instantly he felt himself dropping!

He flung backward to be in the middle of the slab of stone. Down, down it went! After about a hundred feet of slow dropping, it picked up acceleration and fell like a plummet. Mansfield was thrown to the rock with a force that knocked his head spinning!

It must have fallen six or seven hundred feet, but it took only a few seconds so great was the speed. Mansfield clung to the floor of the flashing vehicle, shaking his bruised head. His breathless body felt a gradual cessation once more, his bleary eyes raising to watch the walls move up and past him.

Then, all of a sudden, he broke out into the open, into what looked like a million lights, and there rose before him the screeching and cheering voices of thousands of throats! Milling before his clouded eyes was a vast throng of men and women!

CHAPTER V

The Lost City

SIR JOHN MANSFIELD stood and gaped at the crowd. The clear, invigorating breath of air forced itself through his dust-coated, contracted lungs; he gasped and gasped. His head felt of a sudden so light and odd. There was a clutching, griping ache in his abdomen and head. He tottered on his feet as he left the elevator and stepped upon the ground. It was the last he knew as he pitched over on his face. . . .

Some time later he stirred. A hand was trying to force water through his incredibly parched lips and down his throat. For a while he lay still and sought to acquaint himself with his environment.

A delightfully soft lounge was like balm to his tired and aching muscles, and its soothing miraculous salve crept over him as he lay relaxing. Even his eyelids were too weary to remain open, though he licked eagerly at the liquid which the hand was pressing through his swollen mouth. His lips smacked with the cool refreshment, each drop instilling him with a new-born strength.

Presently he opened his eyes, blinked them. He seemed to see two persons sitting near him. And then with a clarity he perceived that at the head of the lounge sat a girl with a dipper which occasionally brought more water from the bowl upon the table. Near by sat a tall haughty figure with his eyes fixed intently upon the Englishman.

Mansfield felt his head throbbing violently; he fingered it and found a large welt. That must have been some bump he had received. Probably it was that which made him feel so lethargic now. But this water was genuine strength! Every trickle brought a deeper breath.

The man who sat near him, he saw, wore a loin girdle that was made from some light metallic cloth which suggested a tenuousness as it fitted around his powerful hips. The peculiar thing about him was the milkiness of his skin, and, as he moved in his chair and rose to the sumptuously rugged floor, there rippled, from beneath that feminine-appearing flesh, a

superb set of billowing muscles. His massive shoulders were the animate masonry upon which was perched a manly head of exquisite proportions, especially that blonde hair which was combed back with meticulous precision and neatness.

The room was built of some metal, Mansfield noticed, as were most everything else of solid nature within. But the beauty which was strewn about in the articles of furniture was of a strange design. He had never seen the type. A brilliant effulgence lit up the entire chamber.

AND then he turned on his side to take a glance behind him; a sharp breath fell from him. Up to now he had only seen the arms, but now he was astounded at the pure whiteness of the girl's skin, the immaculate beauty of her acquiline features. She was looking at him anxiously, a pair of bluish eyes like pools of liquid sapphire. Her hair was coiled at the nape of her head and it was blonde, the same as that of the man. Her garment fell from the soft contours of her throat and ended a little below her knees.

The man said to him, "How do you feel?"

Sir John Mansfield leaped from the lounge in one gesture, with a cry:

"Egyptian! The ancient tongue!" The man was speaking in the old lingua, with a metallic cadence!

There was surprise, too, upon the other's face; also upon the girl's. There seemed to be a fervent light in their eyes that Mansfield had been able to understand them. And he did. Not for years had he devoted himself to the study of this tongue without picking up, as he could, the conversing in it. The milky-skinned man, heartened by the response, talked to him, and though Mansfield couldn't get each word distinctively he managed to secure the trend of thought. It was a beautiful tongue! Mansfield's aesthetic heart beat appreciatively. He absorbed it greedily.

"Who are you? Where am I?" he managed to ask, realizing his incompatibleness before the mastery of this man.

"I am Yuxa, high priest of Atlantis! This is my daughter, Venia. You are at present in the chamber of the Temple of the Gods! My own upper chamber!"

Atlantis! Atlantis! He had almost forgotten that he had once upon a time set out for such a legendary objective. Then Cheops was right! That papyrus had stated the truth when it had declared the existence of Atlantis! It was here!

He fell back upon the lounge to gather his thoughts. For a long while his dilated eyes swung from the magnificent handsomeness of the man to the dazzling radiance of the girl, the high priest's daughter. Atlantis! It was hard to convince himself that this really existed. These superb creatures! It was almost impossible, yet he didn't have to pinch himself to know that he was in the midst of the truth!

THEY fell into a conversation, the high priest and the man from the outer world. It was an effort on the part of both to acquaint themselves with each other's discrepancies of speech, yet they soon fell into a clear understanding. Already Mansfield was finding this man, and the girl who said not one word, but sat by gazing raptly at him, different from any possible conception he had ever had of ancient Egyptian high priests. Still, he said to Yuxa, he couldn't understand why a man of Atlantis spoke the tongue of a land which had existed long after the disappearance of their own race—a supposedly fictitious race.

But the high priest's eyes were concentrated upon him in a strange manner.

"Sir John Mansfield," he said simply, "the people of Atlantis honor you. For ages and ages we have hoped beyond

hope that from the world above would come some messenger who would conquer the signs of Cheops, our father, and come to us. We have yearned for word from above. Never has it come."

The scientist creased his brow. If it had been possible for him to get in, it stood to reason one might get out.

"I don't understand."

Yuxa raised a bejeweled hand. "You are the conqueror of time. Since Cheops was blessed to descend to us, since the time he conceived the idea of constructing the Great God of Silence upon the burning waste of the desert and thus closing up the only entrance to this wonderful land here, since the period in which he inscribed the papyrus with the only means of entering Atlantis—it has been since then that we have stood by with the knowledge that at some time a brilliant mind would come to us.

"IN reverence to our holy father, Cheops, we kept his wish that at no time should the mechanism which controlled the slits above be neglected. For this mechanism is the only medium which permits one to operate the above openings in the Great God. At the very first move of your knife, our plate showed that someone had read the manuscript and was coming down to us! The people of Atlantis have been standing long at the landing stage, waiting for you. There were times when we thought you had succumbed up there, unable to proceed—like that other happening long ago."

Mansfield's head was in a whirl, but he couldn't displace the picture of that shriveled body boxed and snuffed out in the steps-passageway. The revelation, that a mechanism controlled those entrances and that it was actuated by the men of Atlantis far beneath, dazed him. It seemed hardly realistic, too fantastic, yet he did not doubt the word of the high priest for a moment.

Yuxa was continuing: "We hail you, my man. Your wish is to be humbly obeyed by us."

The scientist was on the verge of putting his previous question to the man, concerning the strange language which should not have been a part of them, when there sounded a click and a portion of the wall slid back, revealing two huge docile blacks, who entered and bowed obsequiously, carrying large silver platters of steaming food. The sight of the savory dishes made Sir John's mouth water. The food was not familiar to him but the odor drifting from the vapory concoctions sent a permeating desire scurrying through his body. It had been long since he had partaken of food! Yuxa and the girl moved their chairs closer.

"Eat, my friend. We shall do likewise."

The Englishman fell to like a starved creature. The warmth of the first dish, a soggy but extremely delectable substance, touched the right spot within him and he hurried on to the next. He drank deeply from the tinted goblet which contained an exotic, bluish liquid that burned like fire as it touched his tongue, but which drifted down his throat with the potency of an elixir. His famished body absorbed the food avariciously. Yuxa sat by, eating sparingly, appreciating the other's persistence.

"Tell me, Yuxa, why do you call Cheops 'the father'?"

The high priest gave him a solemn look. "It would give an insight into the history of our race. I shall explain it to you. Long ago, our people were many. We lived on the face of the earth and were content. History has brought down to us, however, that some cataclysmic transition was being undergone by the earth. Great crevices appeared, vast stretches of land fell away into profound valleys, and many of them did disappear

altogether beneath the countenance of the mighty waters. During one of those transformations, practically our entire race was lost beneath the sea.

"We were a mighty race, the absolute ruler of both white and black. When this convulsion had subsided we were left with but a pitiable handful of what had once been civilization and power. And then this remnant of people gradually found itself being forced back into the inland of the continent, and where there had previously stood mighty cities there now appeared the gloomy wastes of burning sand. Nature was making up its mind, apparently, to conquer us once and for all time.

"The men, women and children were soon quartered upon the earth in a spot about where we are now, and as time went on it was becoming terrifyingly evident that the land was falling, the prodigious plentiful land which produced our every want and filled every need. And slowly from the west there rose toward us the terribly destructive sand! It crept closer and closer until it finally threatened to make our entombment but a matter of time. Something must be done, and that quickly!

"YOU will probably understand our scope when I say that at the time we had developed an intricate system of tunnels, which extended underneath the land in far reaches. There we harbored the recalcitrant blacks, the slaves, and the tunnels were operated by them. There was metal in plenty in the earth's bowels, varieties of rock and earth, which we had learned to segregate into elements and recompose for other uses. The blacks were trained in this work. It was really in the underground that our pulse of existence was contained.

"We finally faced the alternative of creating a habitat below or to allow ourselves to be picked off by the metamorphosis above. So, we rounded up large colonies of blacks for workers, and created this mighty city here. Our men of learning realized, though, that we must at no time be close to the face of the earth. There were too many dangers in that.

"But there was left one spot through which we might at some time go forth. That was the one through which you came. After ages of life here we sent several men through it and then came Cheops. You know, I presume, of that. He met our high priests and scientists, who welcomed him like a long-lost brother. He taught us the science of his own race. We were greatly superior to him, however. Nevertheless, he gradually acquired the sovereignity of Atlantis, gave unto us his own religions, organized us into a unified whole. We even speak the language of the Egyptians; the tongue of ancient Atlantis is no more.

"Cheops pointed out to us the principle which existed on the earth—the survival of the fittest. He told us that the people above were constantly warring amongst themselves, that greed was predominant. It would never do for us to leave our dwellings here and go above again. And we were glad of his intervention.

"True, we have our own turbulences here, but they are solely between the whites and the blacks. And the highly developed mind of the white man of Atlantis can at all times cope with the black evil. We keep the black colony sectioned off by the man-eating matter; those who are our servants are completely docile. They are under our hand and will."

Sir John Mansfield masticated his food slowly, absorbing the words of the speaker. The explanation given by Yuxa held him. Being a scientist, he readily understood the drastic step which had been forced upon the remaining people

overtaken by the predatory sand. It seemed quite plausible. It fully explained the foundation for those legendary rumors of a continent buried beneath the Atlantic Ocean. It seemed highly probable, now that he pondered it, that a remnant of that race had survived for ages and had been injected with the fact; but the years of assimilation with the other rising peoples had induced forgetfulness and had perfected the fact into a theory which gradually descended the ladder of time and became a full grown myth, with no evidence to prove the statement.

THE knowledge of the actual existence of Atlantis left him cold. This civilized people had, then, been throbbing in full force and splendor, when, according to the debatable theological belief, man had started to crawl around in his heavenly garden upon earth! They had been infinitely superior thinkers, when the long-decayed civilizations had thought they were at the apex of their prime.

Suddenly a voice pervaded the entire room and Mansfield saw that Yuxa and Venia stiffened, their heads bowed in reverence.

The voice said: "Yuxa, the council of the men of learning and the priests are convened below to hear the story of our distinguished and honored guest, Sir John Mansfield. Pray take him hence!"

Long after the voice had died into nothingness did the two hold their heads lowered. Mansfield kept flashing his amazed eyes around the room for some explanation to this marvel. From the very walls this utterance had come.

Finally the high priest rose and donned a short cassock which fitted him snugly. He scanned the Englishman's face and stated:

"Ra has spoken!"

The stranger to the land shook his head to clear it. What was all this foolishness! Ra speaking? The very idea made him burst forth into an inward smile. Ra, the supreme deity, speaking from his heavenly throne! Ha! He shook his head that such highly intelligent men might be hoodwinked as this!

But Mansfield kept his face free from his thoughts. He understood now that he was being regarded highly by these men; it wouldn't do to tread upon their beliefs from the very first. He would be frowned upon, suspicion would be directed upon him. And he was already beginning to like this friendly and honest soul that was Yuxa. He told himself somewhat abashedly that if he kept glancing any more at that incredible goddess near him, he might be subjected to the base ignominy of an eye-strain and that, positively, wouldn't do. He needed his eyes now in the greatest happenings of his life, one of the foremost discoveries of all time. He must refrain from eying the graceful figure who was possessed of an artistic superbness that was brilliantly unearthly.

"Come," ordered the high priest. "We go!"

CHAPTER VI

THEY proceeded toward the wall, and Mansfield gazed questioningly as he saw Yuxa stalk straight at the doorless obstruction. Just as he reached it a panel slid back and a large opening appeared. The Englishman halted in astonishment at the apparent miracle and Yuxa, looking back, quickly understood. He laughed and beckoned him closer, pointing to a small colored niche in the wall. He bent over and stretched a thin elastic covering which lay over a small bulb. It was yellowish and flashed brilliantly.

"Every room is like that, Sir John Mansfield. All the corridors are too. When you perceive the niche and walk

straight at it, the emanating waves from your physical body are picked up by this supersensitive globe. It controls the intricate mechanism which unlocks the hidden panel. Kneel over and I shall show you. . . . Ordinarily, it is of dull yellow color. But our bodies are so close that it is operating up to its capacity."

It was stupendous, thought the scientist. The photoelectric cell acted in similar fashion, dependent upon emanating waves. Their very knowledge of it raised his esteem of them immeasurably. They were truly a modern people.

The upper portion of the temple, which the trio were now vacating, shaped up as a gorgeous outfitting of religious designs and garbs. Mansfield found himself going through resplendent interiors one after another. Individually, they were the shrines of the gods which were worshipped devoutly.

The most superbly fitted was the chamber of Ra. At one end was a golden throne of fine carving, next to an altar; the high priest informed Sir John that it was for the eternal repose of the greatest of all divine beings, always occupied by Ra.

"Never," stated the tall blonde man reverently, "has anyone ever seated himself in the throne. Ra, may he ever look upon us with a benign eye, sits there forever and ever."

In rapid succession followed the chamber of Osiris, with an immense effigy of an ox suspended over the altar; of Isis, who had originally been the goddess of the earth but later was enthroned upon a lunar heaven; the room of the god Canopus, with the four corners submerged in water; of Aelurus, the Egyptian deity, who had originally been a gorgeous Diana, but to be unmolested by the giants had transformed herself into a cat.

All of these figures Mansfield recognized with a glowing heart. His archaeological findings had brought him face to face with many of them; scientific lore had given him a clear depiction of all of them.

Well did he realize what this meant, from the standpoint of knowledge! Never had he or any other living person stood in chambers of worship real as this! It was with reluctance that he left them behind.

THERE was one, however, which held him a while, suffusing him with strength and power, as he gazed upon its massive import. It was the covenant of Chou; in the Egyptian category he corresponded to the Roman Hercules. An immense figure of stone stood in the middle of the room. On it was inscribed a prayer form. Sir John Mansfield gazed at it covetously, but a nudge at his elbow made him continue on his way.

He walked steadily downward to the council room, his brow furrowed in thought. The honor of being permitted residence in the temple of the gods was something out of the ordinary. Only the high priests were afforded entry into the shrines. That he had been taken above here showed the respect they had for him.

Atlantis! It kept ringing through his brain without cease! He had discovered the lost race—and found a people worshipping deities absolutely foreign to them. Atlantis men and women who prayed to Egyptian gods! What power that fellow Cheops had! To rule over a people far above his own in intellect. How had he done it?

He thought they were never going to stop going downward, when he came out of his muse. He raised his head to find himself in an immense room flooded with light and replete with humanity At the sight of him, voices broke into a din that was deafening. He blinked to relieve the strain of the brilliance.

Around the hall were seated many men. In the middle of the room was a large

table around which squatted more. Yuxa moved to the head of the gathering, beckoned Mansfield to him. Gradually a stillness dropped upon the audience.

For the first time Mansfield had an excellent view and study of the men of Atlantis. It was a peculiar thing, he noticed how they all seemed alike in their handsomeness and physique; tall bodies of powerful construction; physiognomies sculptured of magnificent animate material. The assemblage of men was enough to make him intake his breath sharply.

He heard Yuxa talking, paying tribute to him. And then, after a while, he found himself on his feet speaking slowly, trying to find himself in words. His eyes were roaming on the eager rapt faces. They wanted to know everything! And he started in to give it to them.

But like a thunderclap every head dropped. Mansfield, standing alone, heard a profoundly raucous voice break upon them.

"Arise! Men of Atlantis! The blacks have risen!"

Again that same voice! What potency had it that made everybody's head bow to his breast so awedly? Yuxa had told him that Ra spoke thus from his eternal resting place. The Englishman wondered.

BUT the next instant, as the tone had died away, every man was on his feet. The blacks had risen! The white men were pouring out in a mass, and Mansfield found that Yuxa was leading him out by the elbow, through the door by which he had entered. With Venia on his heels, the high priest ran upward into the temple. He pattered quickly after them.

"The blacks again!" snapped the high priest. "They must be subdued!"

Flitting after Yuxa was in itself an arduous task. He whirled on like a madman. Presently Mansfield found himself in a small chamber. Yuxa ran quickly to the wall and pressed something. Instantly a large section slid back and before them stretched an open vista of an illuminated country. It was the city of Atlantis!

Mansfield ran to it and peered out. Far beyond he saw a crazy twinkling of lights. From all the houses men were dodging in and out. They were carrying small cylinders in their hands, speeding toward that mad flickering of yellowish green lights. Yuxa brushed by him, holding, too, one of the weapons with which all of the men below were armed.

Closer and closer came the flashes, until Mansfield soon visioned a large mass of black men steadily forging onward. With a grumble, Yuxa tossed the cylinder from him and ran out. In a few moments he was back again, rolling a large machine quickly before him. He kicked the cylinder out of the way and centered the large thing out over the city, then turned its nozzle down upon the mass of men below.

The fighting was fierce now. He heard Venia ask her parent: "How did the blacks get so many cylinders?"

The high priest shrugged his shoulders. His blue eyes were gazing steadfastly at the struggle. The mass of men was coming closer with each ensuing moment. Mansfield saw beneath him huge blacks, Nubian in physique. He had seen two of them earlier, when they had brought into the chamber the food, but they had possessed docile faces. Those below were brutal-appearing in every respect. They smacked of evil and were of savage aspect.

Mansfield perceived a strange thing about the battle. All of the whites were armed with cylinders. But only a few of the blacks were possessers of the same, the rest toting long glistening knives and metallic clubs.

From his vantage point he asked him-

self whether this was a childish prank of some sort. The whites were shooting rays at the blacks without apparent effect the blacks were mowing down their foe with slashing blades and felling clubs! It looked a massacre and his eyes popped. The advantage was all with the invaders. That ray business was no good at all! What was this foolishness?

YUXA clicked a lever, and from the mouth of the machine there spewed forth the same yellow-green spray, but it had wide latitude. It gathered in the entire mass of fighting men.

"It's all over now," the high priest said calmly. "Those simple-headed fellows do not realize that they have no chance. All the time they attack against one-sided odds. It is foolish of them."

But the Englishman was watching closely. And it was far from being over! The two bodies of men were one whirlpool of seething humanity, the whites sending their constant rays into their attackers without damage, the blacks with their few shafts doing the same. It was the wielding of those large blades and clubs which wreaked the greatest toll. The whites were falling slashed and bleeding, the blacks hardly injured. It was very evident, in the face of this, that the battle wouldn't last long.

MANSFIELD whirled on the high priest. "It is terrible! Why don't you stop the slaughter? Look! The whites are being driven back. The clubs and knives are knocking them to pieces!"

The high priest didn't move from the scene. He pointed. "Look!"

And Sir John did look. The thing was turning into a rout, a farce. The blacks were falling in great numbers; and nothing seemed to have struck them! All down the line they were dropping heavily to the ground. Those in the rear instantly gave up and retreated with a celerity that lost them to view soon. The Englishman stood and gaped at the sudden change of affairs.

"What—what was that?" he demanded in wonder. "They—they weren't even touched!"

Yuxa laughed. "The rays! Paralyzed the blacks! Paralyzed the whites! Paralyzed everyone!"

It was true. The men of Atlantis were falling, white and black. What was this? Did these men have to kill off their own just to bring down the foe? It looked ridiculous.

The high priest must have understood the other's quandry. He smiled.

"They are paralyzed but not injured. All will be brought back to life very soon. Our men will be going about their duties shortly, the blacks will be quartered."

Mansfield stared over the edge of the temple and saw that already large groups of whites were beginning to clear away the many men lying prone on the ground. Within a brief space of time the earth was clear of bodies, and had not one seen with his own eyes that battle he would never have thought that a conflict had been staged.

The high priest snapped the weapon shut and rolled it away. Mansfield glanced around and saw that Venia was gone too. The scientist leaned on the parapet in thought. But he got no time for meditation, for Yuxa appeared again.

"The black invaders are a strange type, Sir John. Curiously enough. There is a large colony of them beyond the man-eating matter. It keeps them incarcerated. Nothing can conquer that grayish matter —save one thing. And that is a certain emanation. It devours everything else.

"But the blacks managed to secure those rays, and thus get through the man-eating wall. The blacks which we have here with us are vastly superior to the belligerent ones you just saw. Of course, they were all alike once, but through a

process which I shall show you later, we subjugate them for our needs. But there are some blacks who for some reason or other fail to react properly to our treatment and it is these we have to contend with. They discover where our rays are hidden and manage to get them out to their brethern. But they are really foolish. They cannot defeat us, much as their greedy natures would desire that."

"WHY don't you clean them out once and for all time?" Mansfield inquired. "It would save you all this worry and trouble."

"They are harmless. We could wipe them out for good. But we don't want to. While they abound in their natural grounds we can learn their habits and study their minds. Their brains are an open book to us. We simply endure their tendencies, even to our occasional disadvantage."

The high priest wiped his brow. Though his mien had at no time showed acute trouble, Mansfield saw that the problem of the blacks was a source of displeasure to him. It was he who stood at the head of his people, and it was to him that they looked in time of danger.

Sir John asked, "How about those who are severely wounded?"

Yuxa gazed at him. "They are easily repaired. It is only those who receive a deadly blow that we can do nothing for. You will see."

And again, as they stood there, there came to them that voice! It was by now rasping upon Mansfield's nerves, though the high priest, with his customary awe, dropped his head.

"The dungeons are ready, Yuxa. The blacks are ready to be transformed. Proceed!"

The Englishman's narrowed eyes probed every corner of the room. The dead-sounding tone spoke through the walls, everywhere! But his prying glances found no opening. Nothing!

What mysticism was this that spoke in any room, though the very walls, that received reverent obeyance? Yuxa had calmly said that Ra spoke! But that was utterly too ludicrous to believe, though he wanted earnestly to believe this honest-faced man, the high priest of Atlantis. He scoffed at the idea that it was a heavenly voice. It was ridiculous!

That Yuxa had nothing to do with this deception was clear, Mansfield saw. It would take more than that to make him humble himself like this at some trickery he was aware of. Yuxa had told him that this same voice had spoken down through the ages to every generation of Atlantis, from the day Cheops had died! There was something ominous about this! And the more Mansfield thought of it, the less he could understand it. Being a twentieth century scientist he longed avidly to hound this mystery to its source. But being, also, an honored personage in this holy temple of the gods he realized, too, that it did not give him reason to misapply their trust in him.

Yuxa strode to the panel. "Come, Sir John."

CHAPTER VII

The Dungeon

THROUGH a labyrinth of corridors they went, to pause before a large rectangular glass. The high priest pressed a projection on the wall and the glass suddenly became animate. A stationary picture flashed into view, and after a glance at it Yuxa pressed again and a sectional panel glided back noiselessly.

Mansfield perceived a large platform which led out over a ten or twelve foot drop. They went on it and the opening slid back behind them. Yuxa led him to the end of the stage and he saw a large

cylinder that seemed to be some sort of vehicle. Up ahead, situated every fifty feet or so, were large circular rings of metal braced on stout pillars which were rooted firmly in the ground. Far down the lighted tunnel those circular rings appeared at regular intervals.

THEY entered the car and the high priest approached a large bulb, similar to the one which activated the hidden panel, and turned a switch. Then he waved his hand over the reddening ball. In a flash the car whizzed away. It sped speedily through the suspended circles, which Yuxa explained as magnets operated by the bulb. It was more ingenuity of the Atlantis' mind.

The speed of the magnetic car was tremendous as it whirled through the giant rings. At one time, the vehicle suddenly came to an easy stop, and Mansfield saw through the glass partitions that they had reached an intersection and that another vehicle was whirring by. And in the next instant they were continuing their journey downward.

Along the brilliantly lighted walls there appeared occasionally large stretches of transparent glass which showed subterranean chambers, and several times many men were to be seen at work there. Soon they were passing chamber upon chamber and slowing down. The car gradually came to a stop and Yuxa moved toward the entrance.

A large portion of the wall of glass now showed a jumble of men. Mansfield went through the panel and found himself in a huge underground, cave-like interior which had dozens of illuminated entrances, through which men were entering and leaving.

But what absorbed his interest was the number of surly blacks who were crouched, shackled against the walls. It was the dungeon which harbored the captured men. And lying upon the floor were many whites who had just been released from the paralyzing ray by the counter- and antidotal emanation. They were lounging around, gathering once more their strength, watching haphazardly the proceedings which were about to begin.

At the entrance of the high priest and Sir John Mansfield, the hubbub subsided. Yuxa paced the vast hall, Mansfield following upon his footsteps. The high priest gazed occasionally at some feature of a black who was fastened securely in chains, then strode on.

Yuxa addressed a man similarly garbed as was he, a youngish appearing fellow.

"Kodro, are they all here?"

He nodded. "All the blacks are here. Those who are injured are in the individual chambers awaiting your leisure."

"Good!"

A large group of men gathered around them. Many straightened up and left hurriedly for other parts. Yuxa started at the nearest black.

At the silence which ensued among the whites, there rose from the captured throats a vicious and malevolent abuse, to which no attention was paid. The whitish pupils of their dark eyes were shot with imprecations, their thick voluptuous jowls slobbered with anathema. Their ham-like hands clenched and unclenched with a spasmodic desire to tear and rend.

Yuxa moved hesitatingly by each one, eying every attractive feature which might be made use of. Mansfield noted curiously that he paid no attention to brute strength. It seemed that the high priest was trying to segregate those with some human nature in their physical construction.

AT a gesture of the high priest a white would focus his cylinder upon the fellow, until he slumped unconscious in his fetters; then two others would lift him to their shoulders and carry him out.

Those who were passed by raised a bedlam of menacing snarls.

It took several hours for Yuxa to make the entire round of the chamber. More than fifty likable prospects had been saturated with the devitalizing ray and had been taken forth. The high priest nodded almost imperceptibly to Kodro, then turned to Mansfield.

"Now you shall see how we do away with these creatures. It is the most humane passing for them. They are too base for our needs and will be better off where they are going."

There came through the portal at the far end a large contraption on wheels, with Kodro moving actively about it directing its slow progress. The crate-like construction was shining with a bluish light from the outside and the men steered it with the utmost care into the middle of the room. A hush came over the blacks as they viewed it.

Mansfield could not make out the contours of the thing; the strange creamy azure effulgence lay over it all. The captives' eyes were shot with terror. They knew what that object was that stood near them. Gone was their struggling; spent was their smoldering hatred; present was a terrifying palsy that wracked their brawny bodies.

A white reached up and unlocked a side of the big box on wheels, and with the release of the heavy door slid out the bluish light, clinging, however, to the opening as it swung. There, staring out from the center was something grayish which bubbled seethingly.

The deathly silence was split as the blacks renewed their fury, putting forth their utmost strength in an endeavor to release themselves from the links. The sight of that grayish matter had imbued them with a ferocious, maddening frenzy; they shrilled ear-splittingly, rolling their blood-shot orbs insanely.

Yuxa moved down and pointed at one. "He!" said the High Priest.

The huge negro was suddenly set upon by a half dozen whites and loosened from his fetters. He fought with utter abandon to free himself of the many hands which held him safely, cried, begged, wheedled. He twisted and contorted his body. The whites lunged toward the thing on wheels, lugging their load of human flesh, and bracing themselves before the aperture they heaved him directly into the grayish matter. An unearthly cry burst from him as he slopped into it.

Mansfield, unnerved by the procedure, stared at the sight of the black body plopping into the stuff. The head and the right arm struck first, sticking in it like glue. The gray matter started to spread over, covering him up, and slowly there began before Mansfield's eyes the complete dissolution of the black body.

The matter ate him up as it burbled over him and in a short while there was nothing left in view other than a black shank. In a moment it too was gone. The drab essence kept reaching out reflexively for more, unsatiated.

So this was the man-eating matter? What a demoniacal means of eradication, Mansfield shuddered. What could that stuff be, anyway? It looked like some sort of malignant animal matter. He fell back from the thought of putting that through a microscopic study.

As he watched, he noticed that the thing was starting to creep from its shallow depository in the crate on wheels. Kodro slammed shut the door with the bluish emanation. After a short respite he opened it again, revealing the settled organism huddled in the center.

The blacks were glaring at each other, vividly aware of their own impending fate. And they knew that nothing could help them now.

Yuxa said to Mansfield, "The man-

eating matter is the only thing that cowers these brutes. There is a ribbon of this stuff separating the black colony from the white. It is controlled by fixed rays of this bluish light. The blacks cannot get out unless they secure cylinders of this ray, which they often do."

"But what is that awful thing?" the Englishman persisted.

"In some ways it has been a good thing for us, Sir John. I don't know what it it. Aeons ago, our scientists were experimenting with animal cells and thought they had struck the creation of life. They concocted a large amount of the matter and settled down to wait for the outcome. They had visions of creating man—imagine that! You can easily wonder, now that you've seen it work, why it was that the whole land wasn't eaten up. The matter started in to devour everything after a while. If it hadn't been for the fortunate discovery of this repellent ray, life would have succumbed here. It is the only thing which keeps it in check."

The process of eliminating the blacks was continued, but Mansfield turned from the sight with a shudder and strolled absently toward a lighted portal. This was getting him upset; it rasped on his sense of fairness. But these men knew what they were doing. It wasn't often that such a potent weapon was at hand with which to fight the foe. The whites were not to be condemned for the practise.

The strange feature of that thing was its unquenchable hunger. It took body after body into its grisly, inhuman mouth, enough in quantity to displace its own mass. Yet it didn't seem to get any larger or smaller. Its convulsive motion kept calling for more and more! Gray, hideous matter! Good lord! Another shudder shook him.

He was glad he had left the vast dungeon behind, now that he was strolling down the lighted tunnel. He couldn't stand the sight of the thing. Men were moving about constantly. They went by him bowing respectfully. His movements were free from surveillance. He was one of them, a high member.

The scientist warmed at their reception and acceptance. And he began to look at them clearly. It wasn't a recalcitrant gesture or revenge that prompted them to do away with the captured Nubian creatures. It was only that they wanted freedom for the proper outlet of their own cultured expressions. The blacks were a constant thorn in their sides.

And Yuxa was a splendid fellow. He hadn't at any time forced upon him a command of any sort. The high priest realized the difference that might exist between his people and those up above; he was lucid-minded enough to let him follow his own inclination. People down here didn't eye everybody else with suspicion. They lived like one vast family in contentment and harmony.

AND then there was Venia—He wondered where she had gone from that upper room in the temple, during the imbroglio. Well, he'd soon get a chance to get amongst the dwellings of the whites and become friendly with the people. He could study their habits, their likes and dislikes, see what sort of family life was being lived.

He was thus draped in thought when his eye halted at an entrance into a small chamber. There were many bodies of white men there, slashed and clubbed, unconsciously recumbent upon slabs of rock. Around them were several handsome men chatting. At the sight of him they rose instantly.

Mansfield nodded to them and entered. He surveyed the injured men. Several, he noticed, were in critical condition. Nothing was being done to them.

"Why are they permitted to lie like this? They will die."

"No, Sir John," one man said. "They

will not die. Those large bulbs overhead are spraying their mangled bodies with a light that keeps the wounds from making any progress, from deteriorating. We await only Yuxa. They will be on their feet in a short while."

Mansfield gazed at one body with astonishment. A man's whole chest was laid open. He could even see the aorta leading to the heart.

"He will die!"

The white shook his head with a smile. "No. It is not fatal."

He sat down and rested himself on a stone bench, shaking his head in puzzlement. This would be interesting to watch. If they ever patched up that fellow, or all of these men, they were master minds.

Presently the high priest strode in and his eyes lit up with pleasure as he saw Mansfield.

"Thought I had lost you, Sir John."

Immediately the men about him began straightening up the man on the slab, nearest to the door. His head had been slashed from brow clear to the back; skull was clearly fractured. Yuxa and another tall man with him scanned the injury carefully.

Against the wall was a case in which were many strange types of instruments of surgery. From the ceiling fell a whole array of bulbs of many designs. The tall man reached up and brought down a tube which he snapped on. It buzzed with consistency, as a dazzling white light sped from a small hole in the center. The thin beam was allowed to play upon the cloven skull, while Yuxa busied himself with the instruments.

He selected a sharp one, obviously a scalpel, and, unmindful of the noisy ray which was playing upon the fracture, cut loose all shredded flesh and bone. At one place, Mansfield saw that there was at least a half-inch of brain matter open to view. The high priest, with sure and experienced hands, removed all foreign matter from the wound. The steady gush of the ray held by the tall man flowed into the injured place. What it did, the Englishman couldn't perceive, but he did remark that not one drop of blood had been shed in the operation.

When Yuxa had finished his work of delicacy, he straightened up. Another bulb was brought down. It was oblong in shape, with a long handle from its base. The lengthy stem was fitted into a groove at the head of the slab and turned on. From its ugly mouth there issued a deep red which suffused the entire head of the unconscious man.

Mansfield bent closely to watch the effect upon the open cranium. Slowly, ever so slowly, just as though a new growth was being manufactured, the two edges of bone were coming together. An astounded exclamation sprang from him. It was incredible, unbelievable! His eyes were upon the wound, searching for some tell-tale evidence that a cavity had been there, long after the hole had been covered up. But there was nothing, absolutely nothing. The skin and bone had come together and the head was as normal as his!

He stood up, eyes glistening. What miraculous craft lay here! What superhuman beings these men were! Think of it! This would have been a fatal case upon the earth; surgery such as this had never been seen. And it was the rays—rays—rays! The men of Atlantis were literally composed of rays!

YUXA was at another table working. The tall man came back and surveyed the head. He nodded to himself, snapped off the rays, took out yet another bulb and flashed it into life. It was the antidote to the paralyzing emanation, for the large frame of the reclining man went through a shudder, his muscles flexing and reflexing. Presently his eyes opened. He stared around him, sat up with a jerk.

In a jiffy he was off the slab and walking around, smiling.

Just like that! It was almost uncanny! Nobody paid any attention to him; on earth the fact would have been spread to every corner of the world. The high priest didn't even lift his head from the mangled leg he was working upon.

And then Mansfield saw that body whose chest had been laid open. While he had been gasping over the repaired head, Yuxa had finished the man and gone on. He stared at the chest in wonder. The reddish ray was spraying it. There wasn't anything there which would have pointed to a former wound!

Sir John Mansfield went from table to table as in a dream. Soon the slabs were becoming empty and live, healthy humans were filling up the room. When the last man had bounded from the slab and stretched his arms, he turned to the high priest. But Yuxa said, preoccupiedly: "Now for the blacks!"

CHAPTER VIII

The Brain Process

THE chamber wherein the blacks were secluded was a more tempestuous place. Dozens upon dozens of men were entering and leaving. All around the walls were limp forms of the blacks who had been picked from the captured group. They were still under the influence of the paralyzing ray, save for a half dozen or so in one corner who, for some reason, had not been subjected to the unconscious state. These set up a noise which almost deafened Mansfield.

There was a large table directly in the middle of the room. Toward it hastened the high priest. Arranged upon a small slab was a neat row of more instruments. Already there reposed upon the table a gently breathing figure of a black. Somehow, in his sleep the fellow didn't appear so vicious and wicked. There was a somnolence in his features.

A liquid from a flask was poured upon his hairy head, and as the whitish, buzzing bulb sprayed upon the skull, every hair came off like a peeled skin, leaving the flesh bare for operation.

"I'll explain the method," Yuxa said to Mansfield. "We discovered through minute study of the brain that every lobe is there for some purpose. In one there is contained the factor which controls the working of nerve coordination, in another is sorrow and so forth. There is a certain group which caters to emotion. In the operation which I am about to perform you will notice that I remove but a small portion of one of the lobes. It is one of the group of emotions; one which reacts to hatred, revenge, lust and so on. It is that essence of discontent which must be withdrawn before the black can be of use to us. Now watch."

It happened so fast that the scientist barely got a view of what the high priest did. The scalpel made one quick incision into the bone which was like soft putty under the ray. The deft fingers laid back the ends of the flesh and bone; not one drop of blood was evident.

With another slender instrument of the type of scissors, he delved into the narrow aperture and with a quick movement flicked out a piece of whitish matter that was no larger than the shred of a finger nail. Again he did this. Then, with expedition the reddish light focused itself upon the wound. A new flesh and bone coated over the severed lobe.

"It is simple," continued Yuxa. "The sections which compose the brain are, after all, but fountains from which arise every emotion or basic action of the human body. Why shouldn't we strike at the source always, instead of prowling ineffectually in case of need? This fellow, from now on, will retain every sense which he had hitherto been subject to,

but when it comes to the display of those negative features which I mentioned, he will not take part."

"The bloodlessness!" cried Mansfield. "How do you accomplish that?"

THAT is controlled by the absorption rays, which that beam of buzzing light produces. It sutures every incision instantly, softens all bone and flesh immediately for the path of the knife. The blood vessels are not tampered with. It also controls the temperature of the body, keeping it in normal state always. The red ray here creates a rapid growth of superficial flesh which will suffice adequately, until the natural process brings about a full recovery. At no time is there any danger or discomfiture to the patient."

The black's respiratory organs were rising and falling steadily. He was released from his catalyptic stage and his eyes fluttered open. Yuxa shut off the rays.

"Just watch his actions."

The black bolted upright, grinned sheepishly at the men around him. He dropped off the table and gazed inquiringly at the men chained to the walls. Presently he strolled over to the few black men who were conscious and talked to them. Their reception of him was a fiery and blasphemous curse upon his head. He had desecrated his blackdom. But he was indifferent to that. Casually he spoke to them of their incarceration; everything seemed to be perfectly normal to him.

It was at that moment that a huge negro, tugging violently at his chains, succeeded in breaking loose. For a moment the actual freedom dazed him. Then, with a tremendous cry issuing from his lungs, he leaped through the air, his writhing, post-like arms tensed for the unwary figure of the high priest. Down upon him he came!

THE place was in an uproar. The whites stared at this instantaneous occurrence, rooted immovably even when the snaky fingers of the prisoner sunk into Yuxa's neck in an attempt to tear his jugular from his throat. The high priest, taken at such a terrific disadvantage, was pawing the air, his legs sliding from under him. His head was being forced back and his eyes were distended.

With an unconscious gesture, Mansfield's hand shot downward to his hip; with the same motion his revolver flicked out and he fired! Since he had entered Atlantis, the presence of that weapon had almost been forgotten. It was only when his hand brushed by it, that he was cognizant of its contact with his hip. But now—now he was thankful that he had had the foresight to equip himself with it.

The massive black, his insane eyes glued murderously upon his victim, suddenly relaxed as blood gushed from his head. He released Yuxa, who tottered with hand clutching his bruised throat. The black fell prone upon his face.

The sound of the exploding gun reverberated throughout the room and everyone suddenly stopped dead in their tracks, frozen with surprise at the sight of such a deed suddenly done, a body sprawled upon the floor. They whirled with mouths agape to stare at this stranger to Atlantis, holding his hand over a stick which spat death.

THE high priest came slowly toward Mansfield, eyeing him intently, and looking at the weapon.

"What power you hold in your hand, my man! You have saved me from a beastly finish . . . I have often wondered what that was which clung to your mid-body. May the gods preserve you!" A deep sigh fell from his lips.

And with that he came to the stranger and encircled his shoulders with a quiver-

ing arm; an absolute act of brotherhood. The high priest looked at his fellow-men and bowed; they nodded in silent respect.

Mansfield felt somewhat foolish standing there with the gun, and having the men bow before him. He knew that they weren't paying tribute to his magic. It was only their Utopian spirit which spoke at the saving of their leader. Their eyes were suffused with affection; comradely worship. He slipped the gun back into the holster.

Later, when the work was finished in the dungeons and he was taken back to the chamber where the men of learning and the priests were convened again, he had to show them what power really was contained in his "noise stick." He had to explain to them the intricacies of gun powder, the mystery of how the steel jacketed bullet was expelled through the medium of the gases formed by the decomposition of the same powder. He took a stand away from a wall and shot once at it. Then he held aloft the retrieved misshapen bullet, passed it around for all to see. And it was clear that they understood him. This new-fangled thing wasn't beyond their receptiveness.

Mansfield enlarged upon the daily existence of the races upon the earth, and they sat by with studious quietude. There was no greed or conquest in their gaze, nor envy of any superiority which might exist. Rather, they beamed, upon learning that a civilized people existed, and not a bestial people like their own blacks.

One scientist arose and desired to know whether it might be possible for the men of Atlantis to be received cordially and without malice upon the earth.

Sir John Mansfield's face warmed. "You will be the greatest guests man has ever received. Your accomplishments are of a high order, and with your capacity to absorb there is no reason for your not acclimating yourselves immediately."

That brought a shattering din. They clapped and pounded. Then they wanted to know, was he a disciple of their gods? Did all the people above recognize Ra as their supreme being?

"No," replied Mansfield calmly. And he went into a dissertation of the types of worship engaged in. Even with that there was no abatement of the elation which had electrified them. They had been secluded underground for thousands of years, and to change their abode to a more advantageous place was something that thrilled them immensely.

The cheering and yelling was snapped off like a breath. A raucous voice burst in upon them. There was a harshness in the intonation, an admonition.

"People of Atlantis! Ra has heard the tale of the stranger. He has received the enthusiasm the white men have for a new home. Listen closely, my children. Ra does not doubt for one moment the truth as stated by the courageous Sir John Mansfield, but Ra is the supreme being of the universe. And Ra does not wish that his children leave the land of their own making! You shall not go forth! Ra has spoken!"

The voice! That infernal thing! Mansfield stood at the table and observed how a thrilling sensation could be nipped in the bud. The faces which were bowed now rose from the breasts, the countenances impassive. It was a simple matter to see that they accepted Ra and his word as final.

MORE than ever now did the Englishman long for some clue which would dislodge that voice. He yearned to hound it from its lair. Ra! Tomfoolery! Rot! There was no such thing. Someone was making high pleasure of these splendid men of Atlantis! Someone—but Good Heavens! that

someone had spoken to these people's ancestors for milleniums! What was it that possessed such a supernatural power to speak through the walls, through the very passing of time?

It was a genuine puzzle to the scientist. One moment his brow creased with scorn; the next he was ready to admit that he was wrong in his supposition. If only he could find whence that voice came? But the very walls were non-productive. They told not of the secret!

And the whites accepted it without query. They submitted to everything it said with a finality that Mansfield found overbearing.

"Ra guides our fate," Yuxa said with awe. "He is our supreme deity, cares for us from the heaven! He does not wish us to leave here. That is definitely settled."

There was utter faith in his statement, in his calm eyes.

And then things began to happen!

End of Part I.

What Do You Know?

READERS of Amazing Stories have frequently commented upon the fact that there is more actual knowledge to be gained through reading its pages than from many a text-book. Moreover, most of the stories are written in a popular vein, making it possible for anyone to grasp important facts.

The questions which we give below are all answered on the pages as listed at the end of the questions. Please see if you can answer the questions without looking for the answer, and see how well you check up on your general knowledge of science.

1. How is the axis of the earth defined? (See page 6.)
2. What is the distance of the nearest star? (See page 8.) page 6.)
3. How long might it take to count a million, using your spare time only? (See page 6.)
4. What is to be noted about the planes of the orbits of Venus and Mercury? (See page 7.)
5. Do the poles of the earth ever change in position and how does this affect the plane of the celestial equator? (See page 7.)
6. What is the prescession of the equinoxes and how long does it take for completion? (See page 7.)
7. What is the light-second and the light-year? (See page 8.)
8. What is the distance of the nearest star? (See page 8.)
9. What true natural unit has been adopted as the unit of length? (See page 9.)
10. How long would it take for a radio signal to reach the planet Mars when sixty millions of miles from the earth? (See page 57.)
11. What glands in the human body have effects on growth and other bodily features. (See page 87.)
12. What catastrophe may be awaiting the sun and ourselves? (See page 93.)
13. What does the expression "White Dwarf" mean in the astronomical sense? (See pages 93, 94 and 100.)
14. What is the approximate density of the sun? (See page 94.)
15. What is the diameter of the sun? (See page 94.)
16. What is Roche's limit and what does it tell us? (See page 97.)
17. What is the equatorial speed of the earth's rotation? (See page 98.)
18. What was the stadium said to be as referred to the earth? (See page 119.)
19. Give some early measurements of a degree of the earth's circumference. (See page 120.)
20. Why was it unnecessary to take into account the ellipticity of the earth in the Argo and Biot measurements of the Meridian? (See page 120.)
21. What were the units of length and weight adopted by the French Academy of Science? (See page 130.)

The Ultra-Gamma Wave

Many of our stories describing interplanetary war make a very liberal use of rays as being the weapons of offense where ships out in space are fighting one another. But in this interesting narrative, while the ray appears and does its work, the actors in the story never leave mother earth. We have had a number of our best stories from physicians and here again is one of that cult favoring us with a very interesting production.

By D. E. WINSTEAD, M.D.

Illustrated by MOREY

I CLOSED the switch and pressed my trembling hands hard to my ears to shut out the shock of the explosion. There was a muffled roar, a swish of air against my face, and a great spurt of dirt and débris hurtled high into the air to fall in dust and twisted wreckage quite near the sheltered spot where I stood.

It was done! And I heaved a sigh of resignation. I could relax now for the first time in many days. Yes, I could surely rejoice now that it was all over with, the terrible instrument of destruction and with it the most enticing temptation which is has ever been the lot of a poor gullible human to shoulder was gone forever!

I closed my eyes for a moment and reviewed it all with abated breath. The promise of unlimited wealth, the acclaim of millions along with the curses of other millions, the possibility of almost absolute dictatorial power and world domination, with princes, kings, and statesmen alike hastening to do my bidding.

For weeks these visions had assailed me, and it wasn't easy to repudiate it all. But now that it was done, my confidence in my own sanity, at least, was restored. The strain of holding in balance for so long the fate of the entire world, its civilizations, its traditions, its hope for the future, is quite enough to make one a bit mad, at best.

But my relief from mental anguish was not to be so easily attained. After sleeping the clock around, I awoke to a feeling of remorse, and a sense of great personal loss. The flitting away at once of all the desires to which the flesh falls heir is not to be erased from the memory at one fell stroke, as I was to learn.

My sigh was almost a sob as the realization bore in upon me that The Ultra Gamma Generator was destroyed, that no one in all the world but me knew of its having existed. My long dream of wealth and power was ended and here was I penniless, prematurely gray, unloved, unheralded, and sick! I who but a few hours ago held within my hands more potential power than it was ever the lot of man to hold before, and now I was but a puny, helpless worm whose great sacrifice must remain forever unsung!

And so the visions of what might have been continued to come unbidden, and my efforts to comfort myself with the counter vision of my hands stained with

The shocks were somewhat less violent now, and before I realized what he was about Farley sprang to his feet and started running toward a high pagoda nearby.

innocent blood, of a disrupted world where misery, terror, and panic ran rife brought me but small respite.

Depravity? Maybe. But try and put yourself in my place and see how it feels to slough off ten fold more than your fondest dreams have ever pictured! It was the only really big thing I'd ever done in my life, and yet I was regretting having done it! It is easy enough to see that I had done the only square thing there was to do under the circumstances, and I'd have been a poor specimen of man to have done otherwise, but with the instrument of realization in your very hand and no one to gainsay or advise you, it isn't easy to be consoled at having rejected it; believe you me, brother, it isn't easy!

IT was on a day in June, 1923, that I first met Gerald Farley in the seaport city of Victoria, Hong Kong, China. He was stout, middle-aged, and slightly gray at the temples—a chemist in an English sugar refinery with a deal of liberty and a daughter who had spent the past three or four years with him in the Orient.

My good friend Lieutenant Sharp of the U.S.S. Victory had referred me to Farley in my quest of employment. I had met with reverses in recent years and my reserve funds were running alarmingly low.

"You will find Farley a very admirable gentleman," advised Sharp. "His anti-Japanese sentiments are a pet obsession of his which he discusses only with persons of discretion, and one which we, who know him best, have learned to smile at and overlook. Don't let his views influence you too much."

Farley seemed more than pleased with my references. "I am sure you and I can come to terms, Dexter," he told me. "My daughter is leaving me in a few days to return to the States, and I shall require an assistant in my private laboratory. She has conducted this lab, almost independently for the past three years. What spare time I have had has been given to an invention of my own, of which I shall probably tell you more later; in the meantime please do not mention it to anyone."

When all the details of my new position had been discussed and an agreement reached I arose to go.

"Just a moment, Dexter," said Farley, "I'd like you to meet my daughter."

He left the room, but was gone only a few moments when he returned and a slightly built young woman followed him in. She was blond, probably twenty-three or -four years old, her flaxen hair was cut in a sort of freakish bob. From the blue depth of her eyes, she smiled a most cordial greeting. In all, she seemed rather coquettish, and not at all what I had expected to see in the person of a capable spinster who could so efficiently conduct a first-class modern chemical laboratory unassisted.

"Lucile, this is Mr. Lon Dexter," he said, "who will take over your work in the shop. My daughter, Lucile; Dexter. She will be with you for a few days until you get the hang of our routine."

Somehow my surprise seemed to have robbed me of my senses. I was speechless, and thought I must be staring very stupidly. True, I had never seen anyone before quite like Lucile Farley, but at that, the sight of her shouldn't have robbed me of my wits! Yet I must admit that she was stunning. I recall wondering vaguely how I could ever have thought Hong Kong a dull place, and I recall experiencing a keen sense of regret that she was leaving so soon; but aside from that, my thoughts and actions for those few moments are rather vague.

At length I managed to acknowledge the introduction in some manner. I do not recall what it was that brought a

laugh to her lips, but at any rate, the laugh served to reassure me, bring my pulse-rate back to something near normal, and enable me to think clearly once more.

FOR all of that night and for many succeeding nights, and days as well, the lovely vision of Lucile Farley was ever in my mind. Why? Had I met this maiden before in some previous incarnation? Was she that kindred spirit I had sought so long in vain? Was it the call of fate which had brought me to the Orient for the sole purpose of contacting this kindred spirit? Then why was I to lose her again so soon?

I had no concrete idea that I was in love with her, and yet I knew that she had impressed me as no one else ever had, and for the life of me I did not know why.

I had not been in Farley's employ many days before I sensed that his private laboratory was not the real reason why he had employed me. He manifested little or no interest in my work in 'the shop,' as he called it. He had resigned his position with the refinery soon after his daughter left, and was spending all his time in his study at his home, presumably with his invention which he had cautioned me not to mention.

I knew that my employer had something on his mind, but I carefully guarded this knowledge from him. I was not surprised, however, when he summoned me to his study one day some six weeks after I had entered his service.

"Your knowledge of chemistry, Dexter," he said with the air of one who is about to unburden himself, "has surprised and delighted me; for, candidly, I did not secure your services with a view to continuing this laboratory of ours very much longer. I felt that you could be trusted, and I am greatly in need of the help of someone whom I can trust. It is a matter of vastly more importance than that dinky little shop could ever be.

"That is the reason I sent Lucile away; so that I may carry out my plans without her suspecting anything amiss. I do not want her to be worried about such matters, you see, and of course, she would be gravely concerned about my personal safety if she knew the truth.

"The truth, Dexter, is this: For several years I have been attached to the U. S. Intelligence Service, and in that capacity I have learned a great deal that those at the head of our government at Washington do not know, nor will they believe it when I report to them.

"Ever since the World War the Japs have been making colossal preparations for a most destructive war against the United States. Even now their factories are running to capacity, night and day, manufacturing munitions and battle planes. They have realized what our leaders have not been brought to see; that the battleship is obsolete, as the factor of paramount importance in modern warfare. They plan to utterly demolish several of our largest cities simultaneously, in such manner as to discourage any concrete idea of concerted resistance!

"Recently, because I reported this truth, or what my investigation led me to believe to be the truth, I was discharged from the Intelligence Service. My reports were not confirmed by other investigators, they say.

"So you see, I am now a free-lance, and in that capacity I very foolishly wrote a series of articles for one of the leading American magazines concerning this Jap menace; and although I took every possible precaution to prevent their being traced back to me, I have reason to believe that they *have* been traced. They have put Japanese spies upon me and now I fear that they have learned of my invention."

"Oh yes," I said, "I recall that you told me of an invention which you were

working on. And have the Japs stolen it?"

"No, I do not think they even have any idea what it is. If they did they they would make a more concerted effort to obtain it. I have been very careful, and they have learned nothing definite, but they are suspicious, and upon two occasions they have tried to kill me."

I sat up at once with renewed interest. "Indeed! Then why haven't you told me of this before?"

"Candidly, I wanted to be sure of you. I do not mind telling you now that I have investigated you thoroughly. As I said, they are suspicious and are watching me. For that reason I dare not try out my little instrument, now that I have it perfected, to determine the extent of its effectiveness.

"Then you do not know whether it will work successfully or not?"

"OH yes, I know it will work successfully and effectively, but just how much improvement I have achieved over my earlier models I do not know. The Japs *must not* get this machine, Dexter! It is most important that I get this instrument to America as soon as possible, and I want you to help me to do it."

"Of course, I'll do anything I can," I said. "But if it is an invention pertaining to warfare, you have not only the Japs to think of but the English customs inspectors as well. If it is as important as you seem to think why not destroy it and rebuild it after you have reached America."

"Both points are well taken," replied Farley earnestly. "It would be almost but not quite as bad if it were to fall into the hands of the British, and it was my original intention to do as you have suggested, but I have reason to believe that Japan is almost ready to strike. It takes months to construct this instrument, compact though it is."

"And you think that this instrument would thwart them in their designs upon our country, if they have any?" I asked, unable to conceal my skepticism.

"There is no doubt on that score. I know it would. I have chosen to call this instrument 'The Ultra-Gamma Projector.' It projects a vibratory wave which is away and by far the most destructive agency known to man!"

"Ah!" I exclaimed with renewed interest. "Then you have indeed devised one of those 'death-ray' machines which we read of in pseudo-scientific fiction!"

"No, Dexter, it is by no means a death-ray. And I dislike to call it a ray. The wave which it emits is so far departed from the light-spectrum that such nomenclature would be incorrect. I named it 'Ultra-Gamma' in the days before I realized how vast was the gulf between this wave and the gamma ray of radium. You see, I have been playing with this power for nearly eight years, but I have learned only recently how to direct and control it. It has very nearly killed me a dozen times.

"At first I too thought it was a ray, and I called it 'The Ultra-Gamma Ray.' But it does not cause any fluorescence of sensitive chemicals, nor does it act like any of the vibratory rays akin to light. For the sake of euphony I chose to ignore the vast gap between it and radium; and merely changed the name to 'Ultra-Gamma Wave.'

"But," I objected, "if it does not affect a photographic plate nor fluoresence sensitive chemicals how under heaven did you discover it?"

"By its effect upon certain forms of inorganic matter."

"Oh, then it *will* disintegrate matter?"

"No, it does not disintegrate matter. It merely causes certain forms of matter to vibrate with such rapidity as to be very destructive to the surrounding material either organic or inorganic, al-

though it has little or no effect upon organic matter *per se;* otherwise I would not be here to tell about it. It merely shakes the foundation from under organic matter, to be exact!"

"WHAT form of matter is most effected by this wave?" I asked still barely able to avoid showing my skepticism.

"Silicon," he replied without hesitation, "I can shake the foundation from under the largest building or an army, as you will, in less than an hour!"

Yes, I was indeed skeptical, but I was fascinated. Was this strange man really in possession of such a device, or was he merely a madman with delusions of grandeur and persecution? His story was fantastic enough to justify the suspicion of paranoia, and yet his earnestness was most convincing.

"But enough of this!" resumed Farley. "We must get the Ultra-Gamma Projector to America, and my plan is to disassemble it in part, so that it will appear to be nothing more than a very ordinary radio set. That should get us by the customs inspectors, for they are not suspicious. Also I shall leave here a partly dismantled radio set to create the impression that it was radio I was experimenting with and that my device was unsuccessful and has been abandoned. That for the benefit of these Japanese spies who have shown so much interest in me. Then we shall go by way of Japan, visiting Yokohama and Tokio to further disarm suspicion."

"Have you ever seen these spies you speak of?" I asked casually, still not knowing whether I wanted to believe or discredit him.

"No, but one of my operatives has. He chased them away upon two occasions after they had taken a shot at me. It seems they are rather bad marksmen."

I tried to dissuade Farley from returning to America by way of Japan. If he really had in his possession such an instrument as he claimed, I was most anxious that none but my own country might fall heir to it. I think anyone would have felt that way, and I thought that the quickest and shortest route home would be the safest.

"But I am sure I am under surveillance, Dexter," he argued. "And if I were to attempt to sail to San Francisco direct I fear my frail bit of strategy would not be sufficient to deceive these Jap spies. And too, I want to meet Charley Ling at Yokohama. Charley Ling is an operative who has worked under me in The U. S. Intelligence Service for the past year and a half. He has some data which we dare not send by mail, and he cannot come to me just now. I am most anxious to obtain these data which I hope to use in writing more of my series of articles in an effort to induce the American people to demand an adequate aerial defense against annihilation at the hands of some more aggressive power. The Ultra-Gamma Projector, you see, is effective only for purposes of invasion. You could not bring down a plane with it. Though, of course, so long as other powers know that such an instrument is in our possession there will be no attempt at invasion. And it is in my series of articles yet to come, that I intend also to publish the truth about my invention, once it is safely in the possession of our War Department.

"Weren't you afraid to trust a Jap in the matter of collecting evidence against his own country?"

"Charley Ling isn't a Jap. He is Chinese. A very well-educated man, too. And his hatred of the Japs is exceeded only by his untiring energy and his faithfulness."

And so it was that on August 30, 1923, we sailed up rippling Bay and

landed at Yokohama. The Customs officials were the very last word in courtesy, and their inspection of our luggage was but meagre. Their attitude, as a whole, was quite disarming to such contentions as Farley had been advocating.

We were conveyed by jinrikisha to a hotel, the name of which I have forgotten, but it was equipped with modern conveniences and afforded a magnificent view.

Here at about ten next morning we met Charley Ling. He was distinctly Chinese, though garbed in western dress. Of this I was glad, for as yet most of the natives I had seen wore almost no clothing, or thronged the streets clad in jackets sans trousers!

He spoke excellent English with almost no accent, but there was a cunning, furtive glint in his almond-shaped eyes, and his squat round figure seemed to convey a lynx-like slyness that I disliked instinctively. In short, I formed a subconscious distrust of Charley Ling upon first sight.

Farley though appeared to have almost unlimited confidence in him, and they conferred in private for more than an hour.

"Does Charley Ling know anything about the Ultra-Gamma Projector?" I asked when the Chinaman had gone.

"He knows nothing about the nature of it, I'm sure," replied Farley. "But in any event, his only interest would be his friendship for me."

"Did you have other operatives when you were in the employ of the Government?"

"Two others at one time or another, but both worked under Charley Ling. Charley is equal to a dozen ordinary operatives. He has channels of information that would amaze you. Verily, Charley Ling is a wiz!"

I had to smile at that one, and not only because Farley so seldom indulged in slang. "No doubt," I returned. "But I wouldn't believe any unproven statement of his. If your data regarding Jap propaganda are based only upon information received from Charley Ling I vote to destroy the Ultra-Gamma Projector and forget how it was constructed. It is far too dangerous and destructive an instrument to be placed at the disposal of any war-like power, even at that of our own country, unless grave danger threatens. And frankly, I wouldn't believe Charley Ling if he were sworn by the most sacred oath in the temple of the Bronze Buddha that you and I have seen."

Farley turned upon me almost angrily. He surveyed me thus for a moment, then smiled indulgently. "Why, you have seen Charley Ling but once, Dexter," he replied, "while to me he is an acquaintance and friend of long standing who has proven himself in many ways. He has saved my life upon two occasions! Strange; Lucile, too, had that same unfounded prejudice against poor Charley! Oh well, we Americans are so accustomed to thinking of the Chinaman as an ignorant Coolie, that we just cannot realize that all Chinese aren't like that."

"Perhaps you are right in this instance," I replied resignedly. "But I am seldom wrong in my first impressions, and I still maintain that I wouldn't trust Charley Ling as far as I could pull a 'rikisha up yonder bluff, and that isn't far upon a day like this."

NEXT morning we were up early to finish a sight-seeing tour by 'rikisha which we had started the afternoon before. We enjoyed the quaint scenery immensely, and returned to the hotel shortly before noon.

We had locked our valuables in a strong trunk and we fancied them se-

cure; but imagine our consternation when we returned to the room to find that the lid had been forced and the trunk stood open!

"My God!" exclaimed Farley, "The Projector!" He rushed frantically to the trunk and began rummaging inside it. He was right; the Ultra-Gamma Projector was gone!

"It is gone!" he cried hoarsely, "The Japs! They have found it!"

I was terrified. Until this moment I had been skeptical. Skeptical regarding the effectiveness of the Ultra-Gamma Projector, skeptical of Farley's sanity, skeptical of Charley Ling's faithfulness and sincerity, and most of all skeptical about Farley's flaunted Jap propaganda. But if the thing were important enough to induce them to purloin it in this manner—why then perhaps——

I brought myself up suddenly in the course of my gloomy forebodings, for I had sensed a distinct and familiar odor. It was a peculiar perfume scent. That had been one of the things I had disliked about Charley Ling. He reeked with the stuff!

"Charley Ling!" I shouted, "Can't you smell that damned perfume? Find Charley Ling and you will find the Ultra- Gamma Projector, maybe. Though he has probably hidden it ere now!"

Nothing else had been taken. Whoever burglarized that trunk came for the Ultra-Gamma Generator. Farley seemed upon the verge of apoplexy.

"Hurry!" I shouted, not far from frenzy myself, "Let's go question the proprietor! We must find Charley Ling!"

Our room was upon the second and top floor and we descended the narrow flight a lot too fast for safety.

We reached the foot of the stairs however. without accident and then something happened.

There was a roar, a crash, and both Farley and myself were literally hurled to the floor!

I leaped hastily to my feet and assisted Farley to rise. But we had no sooner gained our feet when we were again hurled down. This time something fell from the wall or ceiling and struck me on the left shoulder. My arm went numb and I experienced an excruciating pain in my left side. I tried to rise, sagged, and fell again.

This time it was Farley who helped me to my feet. I could scarcely breathe because of the pain in my side.

"What the hell is going on here?" I grated between gasps, but no one seemed to know. Farley grasped my arm and hurried with me toward the nearest exit. We reached the open just in time to see a building across the street rock, crumple and fall to the ground with a roar! We were thrown to the pavement and for a moment I could not breathe.

Then I looked back at the hotel; it was wavering and tossing like a ship in a storm. I called a warning to Farley and began to crawl away from the structure.

WHEN I had regained my breath I rose to my feet again, only to be sent reeling and fall after taking a few steps. Farley, though as yet uninjured, had fared no better than I, but together we managed to scramble across the narrow street and away from the hotel which was the only two-story building in the block, as I recall it.

We had barely made our way across when the hotel came down with a crash! But crashes and roaring were quite commonplace now as this and that structure trembled, rocked and was hurled flat! Pandemonium reigned everywhere. I saw men and women running in all directions, and that in the wildest sort of panic. I heard screams and cries of anguish mingled with the crash and up-

roar. I saw mangled forms of human beings, and some were crushed beyond all hope of recognition.

Again and again Farley and I were hurled down upon the littered street. At length we desisted in our efforts to stand and sat gasping upon the ground.

Farley had grasped a handful of sand in that last fall, and now I saw him looking at it with an expression of the most profound horror I have ever seen depicted upon a human countenance.

I had collected my wits somewhat. "It's an earthquake!" I shouted holding on to his arm with my right hand.

"It isn't!" he screamed, pointing to the sand in his hand, "It's the Ultra-Gamma Wave! Look!"

The moist sand in his palm was quivering and rolling like something alive, but I did not catch the significance of the phenomenon then.

"You're crazy!" I protested. "This part of the earth is subject to earthquakes."

"Not to quakes like this one, for after all it *is* an earthquake, but I tell you it is being produced by the Ultra-Gamma Wave! I saw that phenomenon once before, when I was hurled down and caught up a handful of mud, and with that tip I devised this gauge!"

His hand went into his pocket and he withdrew a small glass tube filled with a substance which looked like sand. "I can tell the direction from which the waves come with this!"

"By heaven, Dexter! you were right! It was Charley Ling who stole the Projector! The Japs would not use it to destroy their own country! What a fool I have been! I told him too much, and he learned more! The skunk!"

The shocks were somewhat less violent now, and before I realized what he was about, Farley sprang to his feet and started running toward a high pagoda near by.

With a cry of warning I ran after him, determined to catch and draw him back out of the way of danger, but my injury slowed me to such an extent that Farley outdistanced me despite his age and build.

"Come quickly!" he yelled. "He is to the west of us! He isn't far away, and with this gauge I can locate him! When you see Charley Ling shoot first and investigate afterward! And when you shoot, shoot to kill! We must get him or he'll terrorize the whole world! The damned Chink!"

HE was soon slowed down to a rapid walk and I overtook him. But again his earnestness had reassured me, and I made no move to stop him. We hurried onward toward the west as rapidly as we could, and I loosened the service automatic in the shoulder holster underneath my coat.

I shall not attempt to describe the awful scenes I beheld upon that westward tramp. How far we traveled I do not know. It seemed ages that we tramped along upon the verge of exhaustion, hurled down frequently, only to arise and stagger onward. There were natives, entrapped by fallen timbers and by fire, who called out to us piteously for the help we dared not spare the time to render. There were even little children along the way that must be left to their fate, for the safety of the entire world hung in the balance and haste was most essential!

Let it suffice to say that it was perhaps an hour of the nearest approach to hell I have ever known.

We passed beyond the limits of the city for some distance and then, in the middle of a clearing, we saw a small hut with thatched roof and numerous openings in lieu of windows. There were several growths of shrubbery scattered about and Farley whispered a

warning to proceed with care, as he believed the rays issued from that hut.

We concealed ourselves behind this shrubbery as much as possible, but there were times when we had to expose ourselves to view from the hut in order to approach nearer.

It had been quiet for some moments and Farley's gauge failed to register any disturbance, so we reckoned that the Projector had been turned off, at least temporarily.

We were within about thirty yards of the hut when suddenly Farley staggered and crumpled forward upon his face as simultaneously there came the crack of a high-powered rifle from one of the windows.

I dived at once for a dense growth of high bushes near by, and a second shot followed me as I reached it. I fell heavily and screamed, pretending that I was hit. I kicked about for a moment until I had reached a position commanding a view of the hut, and yet remain concealed from view, groaned once more, then lay still.

My strategy worked even better than I had dared hope. After a moment of cautious waiting, the evil, leering face of Charley Ling appeared in the opening. I took careful aim and fired. The head and face disappeared from the opening, but I am such a rotten marksman that I dared not bestir myself as yet.

I waited a few moments, then raised my hat upon a stick to near the top of the bushes. Nothing happened.

At length I got up and crept toward the hut. Suddenly I stopped, frozen in my tracks, so to speak; for there had come another earth shock!

Was Charley Ling again operating the Projector? Did he have an accomplice? Perhaps he was down, unable to arise and had reached up in his spleen and again turned on the power to the Ultra-Gamma Projector?

The earth shocks continued but, strangely, they affected me but little. I ran at once to the door of the hut with my gun in my hand and ready for instant use.

Charley Ling lay bleeding upon the ground floor, and he was nowhere near the Ultra-Gamma Projector. It sat upon a box at the center of the small room.

I was assailed with conflicting emotions for the moment. Charley Ling lay dying with a bullet hole in his neck, the earth shocks outside continued with the Ultra-Gamma machine switched off, for none of its tubes were lighted, and I was forced to the conclusion that the disturbance in Yokohama had been an ordinary earthquake after all. But why had he shot Farley?

CHARLEY LING stirred, and looked weakly up at me.

"You got me, damn you!" he hissed. "But if you had been a little bit later—if you had only been a little bit later!"

"What have you been doing?" I asked, bewildered.

"Been testing out the Ultra-Gamma Projector!" Charley Ling laughed a hard derisive laugh. "I was hidden in the closet of Farley's home the day he explained the damned thing to you. Almost caught me. I have just finished with Yokohama and was almost ready to start for Tokio!"

Charley Ling did not know that he had also well nigh destroyed Tokio. Well, as for that, neither did I, then.

"Why do we continue to have shocks if this contrivance has caused the quake?" I asked.

"I have loosened up something in the underlying rock structures that may slip, slide and shake for a week or more. I hope it continues for a month! I vowed when I was but a lad that I'd some day get even with the Japs for the murder of my father, and I have tried to do

it. But hell! I hoped this thing would prove to be destructive! It's too tame, but I hope I've been able to do a little bit of damage!"

Think of it! The Ultra-Gamma Projector wasn't destructive enough to suit Charley Ling!

When after a few moments Charley Ling fell back and lay still, I turned my attention to the instrument which had wrought such havoc. It looked for all the world like a rather crude radio receiving set. Radio had not been perfected to its present degree of excellence at that time, and the few sets I had seen looked something like this instrument.

It was quite compact, not much larger than a portable talking machine, had six large vacuum tubes all exposed to view across the top, but in lieu of a horn there was a network of small glass tubing fused together and interwoven very much after the fashion of a tennis racket and only slightly larger. This instrument was connected by means of two small wires to the ground and to an automobile battery which sat upon the floor.

I had to bury Farley myself, and in an improvised coffin at that, and true to Charley Ling's prediction the earth shocks continued for many days.

Three weeks later I landed in San Francisco. The Ultra-Gamma Projector went with me. It was upon this voyage back home that I fought the terrific battle with myself and was wracked and torn by a rough sea of conflicting emotions, desire, and scruples.

Next day after my arrival upon American soil I destroyed the Ultra-Gamma Projector. I do not know the secret of the construction of the hateful thing. I would not know the first step in the construction of another like it. Thank heaven for that!

Why did I use dynamite to destroy so small an instrument? Ah! I knew you'd ask. I could easily have destroyed it with my two hands. Or, I could have buried it; but had I dismantled it I might have learned the secret of its construction and would most surely have built another—had I buried it, I knew full well that the temptation to go dig it up would be well nigh irresistible!

In a few weeks I had recovered from the shock of my most harrowing experiences, my broken ribs had healed, and but for a rather well-marked premature grayness, I was myself again. Then it was that I sought and found Lucile Farley—but that is another story; and too, her name isn't Farley now, it's Dexter.

THE END

Terror Out of Space

By H. HAVERSTOCK HILL

Conclusion

A very ingenious idea which has been brought out to the effect that there is a satellite behind the moon and therefore unseen by us is ingeniously developed. Except for the libration of the moon, mankind never sees but the one face, amounting to but a little more than 180 degrees of its equatorial circumference and in this concluding portion the story is brought to a very striking ending.

Illustrated by MOREY

CHAPTER XXIV

Control!

FEELING that things had reached the stage where a peace-loving man like myself could slip away and seek the oblivion that was his due, I began to make tentative suggestions about my return to the South Seas. I made them first to my own colleagues, later to Bo-Kar and his fellow Martians, and finally as a last resort to that compact Council, the international conference had finally appointed to supervise the world's defensive operations.

Even though Spain backed me, Marian and Arabella received my suggestions with a marked coldness; the Martians were frankly surprised, and such members of the international commission as I approached seemed to guess my thoughts in advance and side-tracked me before I could manage to explain just what it was I wanted.

In the end much to my bewilderment I found myself, probably because of the knowledge I had acquired on the voyage, in command of a mixed crew of Earthmen and Martians, and given the job of visiting most of the European capitals in turn. The trip was made partly to finish the training of the earth members of the crew and partly for purpose of propaganda. To that end we carried copies of the picture records and projecting machines after the Martian model, so that people could see for themselves that we were faced by no empty threat.

All sorts of preparations were being pushed forward at top speed; America from Hudson Bay to Cape Horn was a hive of industry, and in England and Germany men were working day and night. The Latin nations, not yet fully convinced of the danger, made no move as far as their respective governments were concerned, though offers of help, which were gladly accepted, came from individual scientists. From Russia there came no sign, and the recently-formed, loose-knit Eastern Asiatic Confederation was too fully occupied with its own internal troubles to worry about anything else.

From the start, strange as it may seem, we had again and again to drum it into

The mechanic and Arabella under his direction played some sort of a devil's symphony on the clicking keys.

people that there was a radical difference in appearance between our space-ships and those of the enemy, that the Adosian craft were spherical and silver, while ours were cigar-shaped and glowing gold in color. We were very particular about this, since it was vital that the alarm should be given at the earliest possible moment once an Adosian was sighted, while on the other hand we had no wish that the population should be thrown into a state of panic by the mere sight of one of the Martians. And, as so often happens, all our work in this direction went for nothing, and the one thing we had never anticipated was the thing that occurred.

Bo-Kar and his engineers had managed to erect, as the first of a chain, a televisophone station outside New York, that developed an extraordinary power and after one or two abortive attempts they managed to effect two-way communication with Mars. We learnt that another large fleet had left Ilan a few weeks after us and that all being well it should be making its appearance on earth in between a fortnight and three weeks. Bo-Kar in turn gave the council an account of the situation here, and, no doubt, gladdened their hearts with the information that no opposition had been offered to the concessions on the moon.

Presently the incoming fleet was picked up thirty million miles out in the void, experiences exchanged, the newcomers warned of the condition of things on Ados and advised to steer clear of that unhealthy planetoid and make all haste for earth.

Meanwhile the scientists of two planets were working in a big laboratory they had taken over close to Niagara in the rather hopeless task of attempting to discover the nature of the green haze on Ados and its relation to those vibrations that had so seriously affected all magnetic recording instruments. A section of astronomers was also busy, purely from an academic point of view, checking up the reasons why they had not deduced the existence of Ados before now.

SOMETHING approaching a feasible explanation of this came to light, when Bo-Kar one day casually produced a rough map the Martians had made of the remote side of the moon. For long a certain school of astronomers has held that the moon is more pear-shaped than round, with the larger and heavier portion turned towards the earth and the stalk of the pear, if one can call it that, facing out into empty space. But Bo-Kar's map showed that both the pear—and the spherical school were wrong. The remoter side of our satellite was more or less hollow, as though once that hemisphere had contained a vast sea which had dried up in the course of the ages. From certain calculations we were able to make, the suggestion arose that the mass of Ados, taking into account its distance from the moon, almost completely counterbalanced the loss due to this concavity on the moon. Whether those calculations were right or not I cannot say; I merely record the facts as they were given to me; at least they supply to a layman, like myself, a feasible solution of the problem.

The building of the earth space-fleet was well advanced and still no sign had come from Ados. It seemed as though they had been satisfied by that series of raids made now many months before and had drawn off, probably to perfect arrangements before launching a final desperate attack on earth. Of course we had no means of knowing whether or not we had been visited in the interval by any spheres which had come purely on a scouting expedition and managed to keep their presence hidden from our observers. Such a thing was not likely, nevertheless we had to admit that it was

a possibility, and far from being a pleasant one.

One evening a call from Ilan came over the televisophone to Bo-Kar, a jubilant message from his home planet to say that the secret of the green haze had at last been run to ground by the Martian experimenters, and a means of nullifying it discovered. A full report would be ready inside of twenty-four of our hours, and arrangements were made between the two parties for recording instruments as well as for human observers to be ready the next night at the New York end, to receive the detailed information that would probably go a long way towards bringing about the final defeat of the Adosians.

I was in London myself at the time, helping to put the finishing touches to some work on the English side, and so I was not an eye-witness of what happened, but I had the full tale later from Spain and Bo-Kar, both of whom were on the spot.

Practically to the tick the two stations got into communication, a slow enough business when you remember that it took anything from five to six minutes for a message to pass from its source to its destination.* After some preliminary conversation the Ilan station gave the signal that the transmission of the report in full detail was to start immediately. All the recording instruments were set ready, and the aural and visual observers took their places. There must be no possibility of a mistake now, and machines and human beings would act as a check on each other.

THE formal beginning of the report came through perfectly, but the instant it reached the vital stage, across the current of sound from Mars there cut a pulsing rhythmic note, faintly musical, yet strong enough to drown completely everything that was being transmitted. It was the first time that many of the Martians had heard this note and they were inclined at first to put it down to some species of atmospheric or cosmic interference.

Spain, on the other hand, would have that it was nothing of the kind. He was quite positive, he declared, that it was the same species of transmission we had heard the night before our departure for Mars, and he recalled, what Bo-Kar had seemingly forgotten for the moment, those warning signals we in the Tellus had received and recorded on our way back to earth. The records of these were at the moment somewhere in the televisophonic station, and as the recording machines were already at work the two specimens could be compared later. But even in the absence of this comparison Spain had absolutely no doubt that the present interference originated from Ados. His manner, more than anything else, decided Bo-Kar, though probably the Martian was more than half-convinced already, that this was a deliberate attempt at interference, expressly designed to prevent us getting hold of vital information. If that was so it indicated that the Adosians were possessed of a higher degree of intelligence and a greater grasp of the problem confronting us, than we had so far credited to them.

But to whatever the interference should ultimately prove to be due, the fact remained that all attempts to get the necessary information from Mars were unsuccessful. Over a period of a week the New York station was in almost constant communication with Ilan; many messages passed to and fro between the two stations, but the moment any reference was made to the green haze or any other matters relative to Ados the beams were jammed.

In desperation it was decided to code all messages. Far from having the de-

* Mr. Harper is assuming that Mars was at this period sixty million miles from Earth and that the waves from the transmitting station were traveling across space at the speed of light, i.e., 186,000 miles per second.

sired effect the experiment merely resulted in all communication between the two planets being completely cut off. All this in itself was bad enough, but, worse still, it gave rise to the further disquieting suggestion that the Adosians had in some fashion achieved a command of Rocan, sufficient at any rate to guess the purport of all our messages. It was an idea that led us at first to credit the Adosians with powers they did not possess. A feasible solution was offered, however, when someone recollected the Martian ship that had been lost in the battle in the void. Our presumption—so strong as to be almost a certainty—had been that the vessel, after breaking in two, had crashed on the planetoid and her crew had been killed the moment the air escaped from the stricken vessel. Now, unless we were to believe that the Adosians possessed the miraculous power of translating offhand a language utterly alien to them, there seemed a strong possibility that some at least of the crew of the stricken ship had escaped with their lives.

Additional force was lent to this idea when we discovered that it was only when the conversation turned towards Ados and matters relative to that planet that messages in Rocan were interrupted. On the other hand messages in code or in English were jammed right at the start. Obviously then the Adosians were taking no chances of anything getting over in a tongue they did not understand.

The net result of all this was that in one way we were hampered in our efforts; on the other hand if anything was needed to spur us on, we found it in the probability that some of our Martian allies were captives in the hands of the Adosians.

There was another result, one entirely unforeseen by us.

The attack on the televisophonoc station outside New York came literally without warning, the spheres dropping down on it out of a clear sky. Inside ten seconds the station and its surroundings were completely destroyed, and where it had been was left a devastated wilderness, covered a foot deep in a lava-like substance that took long to cool. Fortunately the attack had been made during the day and at a time when there were comparatively few people about.

With the realization that no satisfactory communication between the two planets could be kept up, owing to the Adosian interference, the place had actually been temporarily abandoned, only a skeleton staff and an emergency operator being retained. Bo-Kar and his staff were installed in quarters in Washington where they were conducting certain experiments whose result will be noted later. Sad as it was to think that the skeleton staff had literally been blasted into nothingness, to one who took the wider view of the needs of the hour, there was consolation in the fact that men, whom the two planets could ill spare, had escaped death and destruction.

CURIOUSLY enough the Adosian fleet seemed content with the wrecking of the station, for, that completed, they disappeared again into the void. In one way this heartened us. It showed that their preparations were by no means yet completed. They evidently needed more time before launching the full strength of their Armada, though in the interval they would take every possible step to prevent us acquiring information likely to lead to their defeat. It was a very natural conclusion that if we could manage to get the result of the Ilanian scientists' investigation of the green haze, we would have in our hands a weapon that would remove the Adosian menace forever.

My recall came while I was in London. My space-ship, as well as all the others scattered round the world, was ordered

to rendezvous at once. My own destination was given as the space-flier park in British Columbia. All up and down the globe, wherever the necessary materials and equipment existed, space-ships on the Martian model were being built, but as soon as they were ready for launching, save for an odd ship retained here and there purely as a precautionary measure, they were concentrated in one or the other of the half-dozen parks concealed in the heavily wooded districts of the Western United States and Canada. It was an arrangement that had been made with the full consent of the participating powers, for it was felt that only in such fortunate districts could the task of camouflaging the giant craft be undertaken with any degree of success. Elsewhere they would be readily visible and vulnerable to any sudden attack launched by a scouting party of Adosians.

I found Bo-Kar and some of the members of the international commission awaiting me, and in a few words they outlined the situation to me.

To begin with two ships were to be sent out with a two-fold object. Firstly they were to intercept the incoming Martian fleet and warn them of the latest developments, and secondly it was felt that a space-ship equipped with televisophonic apparatus could, if it got sufficiently far out in the void, make connection with Ilan and get the vital information before the Adosians discovered what was afoot. Two ships, traveling separately, would stand a better chance of success than one; but, as an additional precaution, they would both be painted a dead, non-reflecting black that would make them virtually invisible against the background of the void unless one of them should happen to occult a star at the moment an Adosian observer had his instrument trained on it. The chance of this happening however was only about one in a hundred thousand; in the case of two ships the odds against them both being discovered in this fashion were considerably greater.

"THE first ship," said Bo-Kar, "has already been selected. It is our own *Roca*, and it will start off at midnight to-night, with a volunteer crew of Martians and some Earth-men supernumeraries who have begged to go. Gonar will command."

"And the second ship?" someone asked.

"I am coming to that," Bo-Kar replied. "Mars must not have all the honor. This one shall be an earth ship, *Tellus*, the first built here to be commissioned, and her crew and commander must be Earth-men, save that for safety's sake a few experienced men of my own people will accompany them."

He paused. I guessed what was coming, the call for volunteers. But it never came. Instead:

Retallick stepped forward quickly. "I ask for the post of commander," he said.

Slowly Bo-Kar shook his head, and I saw the eagerness die out of Retallick's eyes and the pain and hurt creep in.

"You're wanted here," Mackin said, taking the words out of Bo-Kar's mouth. "If anything happened to . . . to your esteemed father-in-law, you'd have to step into his shoes, you and your wife. No, *you* can't go, can he, Bo-Kar?"

Before the Martian could answer Retallick spoke again. "That's quite all right," he said, holding himself in with an effort. "I see your point of view, and I won't say you're wrong. Up to a point, that is. But where you're making your big mistake is in this. These two ships are going on a mission where they can't afford to fail. One or the other must get through, and they should be given equal chances right from start. Now, mind I'm not saying a word against our earth-trained men. They're good, better than that in fact. But they've had no training

in the void. They don't know Mars and the earth and space in between as I do. That may sound like bragging, but it's the strict truth."

He ended on a breathless note, and stood, his eyes scanning the faces of the commission, awaiting their decision, hoping he had swayed it in his favor.

Cardigan, an English member of the commission, said something. I gathered he was opposing Retallick's suggestion, but I cannot say what exactly he said. You see, someone was whispering in my ear. Marian, her hand on my arm and her lips close to my face!

"One moment, gentlemen." I cut across the thread of discussion and all eyes turned to me. "Mr. Retallick isn't, whatever he might think, the only earthman who has had experience of earth and Mars and the space between. There are others, myself for example. Therefore I volunteer for the post of commander."

For the moment there was a subdued murmur of voices, the members of the Commission talking one to the other, and I saw eyes turn from me to Marian and back to Marian again. She sensed the indecision, the feeling that this was a single man's job, not the sort of trip on which to send a married man, leaving his wife behind, perhaps to mourn his loss, and sensing it she took the only way out.

"I think," said Marian in her clear voice that instantly silenced the buzz of discussion, "that my husband failed to make it plain that he has volunteered on the sole condition that I accompany him in whatever capacity you see fit. Bo-Kar can tell you that I have passed my space-training tests in the void, and that I measured up to the standard of competence he set. Further, come what may, we wish to face the best or the worst together. Should we fail, we die with the knowledge that the fault is none of ours, happy to the end in each other's company, content at the last to pass from life together after doing all in our power."

We could have heard a pin drop. From the tensity of the silence I knew they had been impressed. Had they been demonstrative men I think they would have cheered. As it was half-a-dozen heads bent close together, whispers passed, then Bo-Kar turned abruptly to me.

"We agree to your condition, Mr. Harper," he said. "The start is timed for midnight. Take over control before that hour, the sooner the better.

THE big hand of the earth-set chronometer crept slowly round to the appointed hour. Outside, the landing field was in darkness, though dim figures moved hurriedly backwards and forwards between the two ships and the camouflaged hangars. The ships themselves, painted a dead non-reflecting black, were practically invisible. An observer a few hundred feet above us would not have noticed them.

Despite the fact that our last minute preparations were all carried on in the dark—we deemed it wiser not to show a light of any sort; these days no one could say what prowling spheres might be about—everything went with a swing and a celerity that spoke well for the organization behind it.

Eleven thirty. Half an hour to go. Time for visitors to make their departure.

The commission gave me final instructions, shook hands solemnly one by one, turned and marched out. Bo-Kar, Norna and Retallick lingered a moment after. The big Martian took my hand in the two of his, held it a second, and—wordless—gazed into my eyes. Had he spoken with the tongue of eloquence he could have said no more than that glance conveyed, and somehow I felt the better man for the knowledge that this man from an alien world trusted me so.

The double handclasp broken, he turned to Marian.

"Good hunting—and a quick meeting again, Harper," said Retallick. Then almost in a whisper, "You lucky beggar!"

Norna, I think, meant to follow his example and shake hands, but at the last moment, overcome by a sudden impulse, she changed her mind, and bending swiftly, kissed me full on the lips.

"It is the custom," she said and left me wondering just what exactly she meant.

They went. I waited until they had gone, until the word came from the guards that the last of the visitors had left the ship, then I gave the signal to close and seal the entrance ports. The hollow clang they made on contact, echoing throughout the ship, roused grim forebodings in me, as though someone had sealed the entrance to our tomb.

Slowly the hand crept round. Three, then two minutes to midnight.

A touch of a key on the bank in front of me, and the great gong sounded control quarters. Gradually the gravity screens shifted into place; the control light, showing "All Clear," glowed above the key-bank. Another instant and I had thrown the switch that sent the magnetized current flowing through the gravity screens, and that raised us gently from our landing slips.

Portions of the outer shell, enough to enable us to see about us and below us, had not been shifted into place as yet, would not indeed be moved until we were nearing the limits of the atmosphere. That much was vouchsafed us, a last glimpse at the land we were leaving.

Slowly we rose, slowly the earth dwindled away beneath us, the earth on which we might never again tread. . . .

. . . Footsteps sounded outside. The door opened. Two figures advanced over the threshold of the control-room.

I turned and stared at them. A man and a woman. Spain and Arabella, neither of whom had any right here, both of whom should have been a thousand miles or more away, down on the Pacific Coast, attending there to duties the commission had assigned them.

"WHAT are you doing here?" I said sharply. "We've no room for passengers. I'd land you both if it wasn't too late. But we can't go back now and upset our schedule."

They came farther into the room, Arabella closed the door carefully behind them.

"We came in to-night, after you'd gone aboard," Spain said slowly. "The general recall order brought us here. We heard what was afoot, that volunteers had already been picked, otherwise, of course, we would have been in the first batch. But we got in, in time to mingle with the visitors as they were leaving. I caught Bo-Kar just before he left the ship. I asked him could I go."

"And he said 'No'?" I took him up sharply.

Spain shook his head. "He said the full complement had already been chosen, but the right rested with you to take another one or two if you wished. He also intimated that it was impossible to get in touch with you now, as all visitors were leaving the ship. I took that as a hint, so I said point-blank, 'Do you forbid us to go, sir?'

"'The power to forbid or permit has passed from my hands,' he said and turning left me. So we came here."

"Diplomatic of Bo-Kar, I must say," I remarked. "Throwing the onus on me. I suppose, if I did the right thing, I'd send you both into the airlock and shoot you out into space. You see, we're carrying neither passengers nor freight this trip, and I can't think of any other heading you can come under. As it is I suppose I'll have to put up with your company for the duration of the trip. But why the deuce did the two of you do it?

the guards shouldn't have let you pass."

"Seeing us talking to Bo-Kar, they probably took it for granted that we were late-coming members of the crew," Spain retorted. Then, "Why did we do it, Billy? I don't know, unless it is that we've been through so many queer scrapes together that we thought we'd like to be in at the death."

Quite a good excuse, if it came to that, but then a more tactful man would have used a less suggestive word.

CHAPTER XXV

The Race

YET, once I was able to consider the situation calmly, I had to own I was not altogether displeased to have Spain and Arabella on board with us. The arrangement had its advantages. The others, though known to me by sight and name, had not gone through strife and stress with me; I had had no opportunity of forming an opinion of their abilities in a crisis, while, on the other hand, I knew of old how reliable the Spains could be. True, this new warfare was a novelty to them, more so than it was to me, but they had done their training and passed with honors. That labelled them as fit to act as my subordinates and within limits to exercise their own initiative.

Still for discipline's sake I told them what I should have thought of them, pointed out the difference two extra mouths to feed might make on a long space trip, and that done thanked the God that made us that they had had enough enterprise to stow away.

The first few days passed without incident. What was happening on Mars or earth we could not say. We dare not open communication with either planet as things were, but once away past Ados and out in the void we might be able to get in touch with Ilan. As long, however, as the planetoid was between us and the red planet there was always the chance of the Adosians cutting in on our signals and either jamming them or picking up information we did not want them to get.

There came a day when I could look back and see earth and its two satellites drifting into the void behind and to one side of us. Communication with our home planet was more than ever out of the question, but I began to debate with myself the advisability of calling Mars. For some reason I could not define at the time I decided to defer any such attempt for twenty-four hours. It was just as well that I did.

Improvements had been made in the two ships in the time they had been on earth. The one change I liked best and that gave me the greatest feeling of safety was a repelling ray device. Our greatest danger on previous trips so far had been from wandering meteorites. The possibility of their presence entailed constant watchfulness and an alertness that strained one's faculties to the utmost. True, our early magnetic devices picked the meteorites up while yet a considerable distance from us, still because of the sudden changes of direction necessary to avoid them we dared not accelerate to peak.

While we were on earth a number of experiments had been made, and finally a good deal of scientific team-work had resulted in producing a piece of apparatus that exercised a repelling influence on any body near enough to affect our warning magnetic devices. As soon as a meteorite came close enough to set the sensitive machine in action, a warning gong rang, and a species of switch operated to throw the repelling ray in the right direction, and sheer the meteorite away off its course.

Actually it was to this instrument that we owed our salvation.

The note of the gong, reverberating through the ship, roused all of us who were not on duty. Not one single note, but a succession, as though the ringing would never stop. I could only think that we had run into a meteoric cluster, and the repeller ray under its influence was trying to drive every way at once. Fearful it would become overloaded and blow out, I raced to the control-room, where Spain and the second officer were sharing responsibility between them.

I flung the control-room door open.

"What's wrong?" I demanded. "A meteoric cluster?"

"Meteoric cluster be jiggered!" said Spain politely. "Have a look in the view-finder thing yourself."

He turned as he spoke, wiping the beaded sweat from his forehead with a heavy hand. I stole a glance at the second officer, a Martian, and I fancied he looked a shade paler. I had not time to note more than that. I bent over the vision-plate.

The instant I did so I realized the cause of their agitation. No meteorites these, but, looking small and remote in the void, a flight of the detestable spheres. Strung out across space like a row of silvered golf-balls, the sun glinting fiercely on them. I whistled softly. No wonder the gong had kept ringing, defying all efforts to stop it. It took a moment for the full implication of what I saw to dawn upon me. Yet when it came, it came with a blinding, overwhelming force.

The spheres must be dead ahead of us, right in our course, else they would not have affected the warning apparatus so strongly and so constantly!

I glanced from one to the other of the pair, and in the eyes of Earth-man and Martian I saw the same thought mirrored.

"I've rung down," said Spain in a tone of forced calmness, "and we're slewing round. I daren't use the rocket tubes, though. They'd see the gas escaping."

I'd thought of that, too. I'd also thought of something else.

"They've probably got something of the sort, too," I said, nodding toward our repeller ray instruments. "If they have, they've located us already. Remains to be seen, though, whether they've discovered we're a space-ship or not. Let's hope they think we're a meteorite of sorts."

The Martian shook his head. "We're against the sun," he said. "If they see our silhouette . . . Our one hope to date is that we've been traveling so fast they couldn't make our shape out."

Forgetful of discipline, peering again into the vision-plate, he clutched my arm, muttered . . .

I shook him off. "What is it, man?" I cried, shouldering him aside the better to see for myself.

"The *Roca*," he gasped. "We've forgotten her. She's ahead of us. They . . . they'll get her."

All too true. In the excitement we had overlooked the fact that our sister ship was well ahead of us. Invisible to us, we had not troubled about her to date. But now, as we watched, we saw a cigar-shaped silhouette against the gleaming line of spheres. Her black painted hull reflected no rays of the sun in itself, but as it swerved to avoid the spheres it momentarily blotted them from view and in perspective its shadow-shape was flung on them as a background.

A flash of light in the vision-plate, a gleam of brilliant green, and the spheres were on her like a pack of ravening wolves. By some uncanny means of their own, the Adosians may have guessed the line we would take and waited for us, or perhaps the encounter was, after all, no more than accident. No one could say. The reason of it

mattered little, the motive was all that counted.

I don't think I've ever thought quicker in my life. My instincts were to go to our consort's rescue. My instructions ran dead against doing any such thing. No matter what happened to the other, one ship had to get through. The *Roca* I judged, was already doomed; the longer I balanced in indecision the more likely we were to share her fate. She must look after herself. We held the future of two planets in our hands. Yet I knew some of her crew, Martians and Earth-men, gallant fellows all.

I turned from the vision-plate. "Full lift at an angle of forty-five degrees, and the topmost pitch of acceleration," I ordered.

I scarcely knew my own voice. It had grown hard. Naturally. I had to steel myself to give the order.

Spain gave me one look, then one after another pressed the keys on the bank. The *Tellus* responded instantly, rising so steeply that we were almost thrown off our feet. The spheres seemed to be slipping down at an angle, an immense distance beneath us, the void aflame with the hell's light of their rays, the *Tellus* into them glowing white-hot, horribly visible now.

Then came the roar of our rocket tubes, thunder on thunder, and under the kick of the reaction we sped like a black bullet across the star-spangled blackness of space. It did not matter now whether or not the Adosians could locate us by means of their instruments of detection. The gray-green stream of the rocket gas, drifting comet-like away behind us, was ample advertisement of our presence.

It had the effect I expected, the one that, in a way, I dreaded. Half of the spheres desisted from their destruction of the *Roca*, snapped off their rays, rotated, and came on hurrying after us.

I watched the dial-hand of the speed gauge anxiously, flashing every now and then a glance back at the vision-plate. We were taking all the acceleration we could stand; in a little the rocket tubes must stop discharging lest we shake ourselves to pieces. It remained to be seen what speed the spheres could reach. We were too far away for their rays to touch us yet, but if we could not show them a clean pair of heels, a few hours would see us looking our last upon the round of space.

For a time the spheres seemed to be gaining on us, and our hearts stood still, the more so now as the thundering of the rocket tubes had died away. We had reached our peak of acceleration; in this frictionless void we could hold our speed forever if necessary, but we had yet to learn whether the spheres could reach a higher pitch.

I looked away. Too much staring at the vision-plate leads one to imagine sights that are not there. Five long minutes dragged wearily by before I would permit myself another glance, I might have been mistaken, but we seemed to be holding them. The others in the room were doubtful; they thought that if we were not maintaining our distance, any gain the sphere had made was so small as to be almost imperceptible.

A little later I looked a third time, and—did I imagine it?—the spheres seemed, if anything, a trifle smaller. I said nothing, did not even ask the others this time to check my vision. Optical illusions. Tired eyes. Kindred phrases jumped into my mind. Also, I knew too well how strong could be the power of suggestion, how easy it was to see the thing one wished—one hoped—to see. Time would tell the true position. In an hour we would know for certain. Even granted they were overhauling us,

it must be hours, at our present relative rates of speed, before they could come near enough to strike. Meanwhile . . . Well, meanwhile we could only wait and hope and make our small preparations to retaliate as lay in our limited power.

Twice the warning gong went and twice our hearts thumped in sheer nervousness, but each time it was only a meteorite, one a globe of iron and nickel two hundred yards across, the other a thing no larger than a man's hand, yet large enough to have sent us to destruction if we had met it head on at the pace we were traveling. But our warning gong and repeller rays were working perfectly, and each meteorite sheered off, passing us safely at a distance of many miles.

Then abruptly, without warning, the gong began an intermittent ringing. I sprang to the vision-plate, fearing I knew not what. It was still angled on the spheres behind us, but I could see now that they were only about two-thirds their former size. They were falling behind, we were gaining on them . . . slowly.

It could not have been the spheres then that had actuated the gong and that still kept it ringing. While I was shifting the vision-plate round from one angle to another a bell tinkled twice, the call from the operating room.

"Answer that, Spain," I said. "It's probably Marian. She's earth operator on duty."

It was. She had something to say, good news of a sort. The televisiophonic screen had been registering the last few minutes registering in Rocan. She had been afraid to answer, doubting whether the spheres could cut in or not.

"Switch over here," I told Spain. "I'll answer."

I guessed, I felt somehow that it could be only the one thing, and in the last moment before the transmission room switched across to the control-room connection, I moved the vision-plate again, giving it a wide-angle range of ninety degrees with our nose as dead center.

Tiny golden specks they leaped into the center of the plate, the great battle-fleet of Mars streaming out to meet us, the fleet for whose arrival all earth was anxiously waiting.

I nearly reeled, dizzy with the reaction. I caught hold of the edge of the vision-plate to steady myself, felt it move and slip to one side under the pressure of my fingers, and when I looked I found my involuntary action had shifted the fleet out of focus.

Heavens, how they must have worked on Mars to launch that fleet in the time! The speeding-up they must have done! The whole planet bent as a single-minded unit to the achievement of the one purpose!

Faint images flitted across the surface of the televisiophonic screen, faint sounds came from the receiver. I tuned in, amplifying until the deep throaty Rocan voice sounded as though in my ear, till it filled the room and every word could be heard by those around us.

I beckoned to the second officer.

"Your people," I said. "To you the honor to hold conversation with them."

He gave me a grateful glance, yet my action was not solely altruistic. I wished to be quite sure what the message was, feared that my knowledge of Rocan might prove inadequate to the strain. A word here and there I caught, but not enough to do more than sense the drift of the message. These Martians talking amongst themselves speak too fast for the average Earth-man to follow what they are saying.

The man turned from the screen at length. "They"—he fumbled for the words—"they have discovered the secret

of that green haze. . . Thee . . . thee vibratory screen. They know how to counteract it. That was the message they were trying to get through to earth. They are afraid even now to tell us. Thee . . . thee Adosians can still interfere in a call. But he—the commander, who is speaking—says that if we connect the picture-recording machine to the screen we can get the message that way, photograph it. Is not that what you call it?"

A great light dawned on me. "You mean," I said, "that he will transmit to us the image of the written messages?"

"Thee . . . thee formula, yes," said the Martian, nodding vigorously.

Why hadn't we thought of that before? The one way to overcome the Adosian interference. They could listen in on all our spoken messages, and jam them if and when they thought fit. But unless they had remarkably sensitive instruments, the televisioned formula for destroying the green haze and all that it implied could not be intercepted, much less interfered with. Its reception, you see, would occupy no more than an instant of time, not a matter of long minutes like the spoken word.

But even when we had the formula, what good would it be to us now? A barrier of spheres stretched between us and earth. We could not, dare not run the gauntlet with so precious a cargo.

Fool that I was. We could re-transmit to earth, of course. But even in that there was a snag. The picture-recording, camera-like machines, with their sensitive plates, must be rigged ready to receive the impression. The various earth stations should be warned in advance, yet I could not see how I could do so. Any message that could not be transmitted instantaneously would almost certainly be jammed. I did think of transmitting the picture record on the off-chance of one of the stations at least receiving it, and making assurance doubly sure by transmitting again at regular intervals. But I decided that would be taking too great a risk. The first transmission might not be recorded—I was practically certain that it would not be—and the following ones were bound to be interfered with. It was too big a problem for me to work out unaided.

The Martian turned from the screen. "It is finished, sir," he said. "Thee picture has come through."

"Good. Rush it to the developing room. I want a dozen prints as quickly as possible."

He saluted and was turning to go with the box camera-like affair tucked under his arm, when I called to him. "By the way," I said, "as you go, send the chief Rocan operator here to me."

He went. A little later the Martian operator came and I put my problem to him. He shook his head. He knew of no way of overcoming the difficulty. The chances, in his estimation, were that even a single instantaneous transmission would not get through. Whereas I had visualized the Adosian interference as a sort of directional beam cutting knife-like across our lines of communication, he pictured it more as a series of concentric rings, a kind of eddy of force palpitating out in all directions from the point of origin. Most probably he was right. In which case there was only one thing left us to do.

Our acceleration had carried us well past the Martian fleet and now we were slewing around in a wide circle to join up with them. I called the Martian commander on the televisiophone, and got through. Apparently the Adosian field of interference did not extend so far into space, nevertheless I felt afraid that the retreating spheres might be able to intercept our signals if in Rocan, so:

"Is there anyone on board who can

speak English?" I asked of the face in the vision plate. The commander himself, for it was to him I was speaking, intimated that he did. Probably he had learnt it when we were on Mars, either through the records or from Thrang himself. Which did not matter.

However, secure in the knowledge that our English conversation would be unintelligible to the Adosians, I told him briefly, as simply and as plainly as I could, what I intended doing, and asked his co-operation. I got it without a second's hesitation.

Briefly the situation was this: The constant researches of the Martian scientists had evolved a formula showing the nature of Ados's protecting haze, and that also showed how to nullify it. The Martian fleet *en route* to earth had received this formula by televisiophone but a few days before. Unfortunately they were helpless in the sense that they lacked the materials necessary to construct the apparatus that would demolish the haze. Such things were not normally among the stores carried on space-ships. But, given the materials and such a work-shop as could be found on earth or Mars, the required instruments could be constructed in a few hours. If I could get the formula into the hands of my colleagues, enough equipment for all our space-ships in commission could be ready by the time the fleet we had just met reached earth.

Our plans made, the Martian and I disconnected. I used the interval of waiting in acquainting all on board with the situation. Sooner almost than I had expected, the vision-plate showed me the Martian fleet beginning to move off. Suddenly from out of their midst one gleaming golden ship shot forward, the gray green streams of gas from the rocket exhausts marking its passage across the void. It was headed earthwards.

I allowed the *Tellus* to fall behind the fleet, and not until the ships were a long way ahead did I dare start our rocket engines. But then I managed to make acceleration under the cover of gas streams from the other ships. By the time I had nearly drawn level with them I was able to cut out the engines, and with the impetus already received forge steadily ahead. The *Tellus*, invisible now, lifted in a long slant, passed over the massed ships and headed out earthwards.

Meanwhile the single ship which had sped on ahead had attracted the attention of the spheres. They had halted in their headlong retreat to Ados, and I could almost imagine them debating the situation. Despite their superior numbers, they were seemingly not anxious to engage the entire fleet. Perhaps they fancied the Martian ships might be equipped with unpleasant surprises in the way of novel or untried weapons, or more probably, like the Martian commander himself, they had orders not to precipitate a general conflict.

But the intentions of this lone ship were seemingly obvious. It was streaking for earth, carrying information that must not be allowed to get there. With a speed so quick that it almost dazzled the eyes, the Adosians altered their formation. Half a dozen ships detached themselves from the bunch, set off in pursuit of the earthward-bound Martian, while others wheeled about and strung across in the path of the oncoming fleet, the green rays in their invisible infrared carrier beams licking out suggestively. The Martian line slowed, halted, wavered — and slowly, reluctantly it seemed, slewed round on their course. The way was barred. The odds against them were too powerful to contend with. That, at least, must have been the Adosians' reading of their actions.

The lone Martian ship, despite its start, showed signs of flagging. It looked

as though the pursuers would speedily run it down. It, too, paused uncertainly in its flight, zig-zagging to escape the clutching fingers of the beams, then doubling like a hunted hare came round in a wide circle that would bring it back to its parent fleet far out beyond the outermost fringe of the wide-flung Adosian fleet. The pursuing spheres whipped round as though to cut it off, but the curve it cut was too large for them to hope to run it down before it reached the rest of the fleet. The spheres flagged in the race and one by one they began to drift back to the main line drawn like a barrier between earth and the Martian detachment. But they must have felt satisfied that they had managed to prevent any message reaching earth.

But, so beautifully had it all been timed, at the very moment that the hunted Martian wheeled out on the long curve to rejoin the fleet, drawing the Adosians after her, the *Tellus* invisible in her black paint, was speeding swiftly far up over the spot where pursuer and pursued had been but a moment before, heading out for earth and safety. Strategy had succeeded where force was of no avail. The maneuver had achieved its purpose of drawing off possible pursuit during the vital few minutes necessary for us to get a flying start.

I had no hope that it would last, however. Even now the Adosians must be discovering that the agitation of their detecting instruments was due to something other than the maneuvers of the dodging Martian. In a little while, though they could not see us, they would get our direction.

They did, sooner than I expected. Looking back I saw a movement in the line of spheres, saw some detach themselves from the main body and come streaking in a dead straight line for us. They had got our direction of flight then. Speed was the one thing that could save us, and since concealment was no longer necessary, I rang for full explosions on the rocket tubes.

The *Tellus* trembled in every rivet as we hurtled through space, yet despite the tremendous speed we must have been making we did not seem to be gaining. The spheres were certainly showing a turn of speed I had not anticipated. For quite six hours they held us, even at times seemed to be gaining a little, and for every second of that time my heart, like that of nearly everyone else on board, was in my mouth. I don't think, however, that any of them—fortunately for their peace of mind—visualized the possibilities I did. Our repelling rays would warn us of approaching meteorites and deal with them in the accepted way, but I dreaded to think of what would happen if another line of spheres suddenly showed up ahead of us. It would be impossible at the rate we were going to avoid them, and a head-on collision would see us all blown into incandescent dust.

"Sir"—a voice at my elbow brought me up all standing—"thee prints are ready."

It was that wonderfully efficient Martian officer back from the developing-room with a dozen dry prints in his hands. He had even — Heaven be praised—with a thorough understanding of what I had in my mind, had them reduced to microscopic smallness. And I had forgotten all about them! But the sight of them brought an old idea back to my mind, and I decided it was worth trying now.

"Spain," I said, "take control, and keep her on her course as she is now. I think we're holding the spheres—at any rate, they're not gaining on us."

"What are you going to do?" he asked curiously.

"I'm going to the transmitting room, in the hope of putting a print over to

earth. That operator's theory may have been wrong. I don't think there can be a continuous interruption. Anyway, I'm taking a chance that as we're a swiftly moving body, shortening the distance between earth and ourselves with every second, we may be able to get through."

The operator was plainly dubious about my chances, but since we were now heading earthwards at velocity peak, he agreed with me that it was worth taking the risk. Something might come of it. At any rate we would have the satisfaction of knowing we had done our best.

I set the print against the grid of the vision-plate, and sent out the earth call. Though the New York station had been destroyed, there were now others in existence in various parts of the earth, and surely one of them would catch my signal. In three-quarters of a minute from the time I called a light would glow and a bell ring in every televisiophonic station on the side of the planet facing us, but the question worrying me was would they understand. Would they realize the moment they saw the tiny print glowing in their own vision-plates that it must be photographed before the image faded? I must take my chances on that.

Watch in hand and with beating heart I waited a full minute after I had sent out the attention call; then on the very tick I pressed the button that made the television connection and released it instantly. The light in the vision-plate appeared and died in a single flash. Thirty seconds later I pressed the button again and held it down while the second hand of my watch ticked halfway round the dial, then released pressure. For good or for ill the picture, traveling on the wings of light, had gone shooting off to earth. Whether it would ever reach there was another matter.

* * * * *

We held the spheres. We did more. As that period of twenty-four hours drew to an end we found them dwindling, a little at first, then more and more perceptibly as time wore on. It may have been no more than imagination—though, if so, it was a delusion common to us all—but the spheres seemed to be altering their course, to be sheering off at right angles, as though they were making for Ados. In a way we hoped that this was so; at the same time the maneuver could only mean that the planetoid's authorities were deciding on some big *coup* that might bring all our plans to naught. But I banished the idea from my mind, for it does not do to think of such things, and as soon as I could I sought the rest I had so long desired.

Nearly twelve hours later I was awakened from a sound sleep by Marian's voice in my ear and her hand on my arm.

"I thought I'd better tell you at once, dear," she said. "We've received a television picture from earth. It's been photographed, developed and enlarged, and here it is."

She handed me the finished print. I sat up and read it through. Following our example, the earth station had written out their message and transmitted it as I had done mine.

Ours had got through. The picture had been recorded in the nick of time, just as it was fading, and the formula was now in the hands of the planet authorities. The work was being rushed through and all space-ships that could be commissioned would be sent off at the end of twenty-four hours. They would carry sufficient of the new equipment to supply a hundred space ships, not counting that for their own use. Our instructions were to rendezvous with them in the void, receive our quota, and place ourselves under the orders of the fleet-commander.

I looked at Marian and our eyes met.

"Inside a week, my dear," I said huskily, "the Adosian menace will be ended forever, or there won't be one of us left alive to worry about it."

CHAPTER XXVI

Victory?

TWO days later we managed to make contact with the fleet from earth, and within another twenty-four hours we had sighted them. Obedient to signals we ran the *Tellus* alongside the flag-ship! our connecting tubes were made fast and sealed against air-leakage, and we ourselves crossed over. We found Bo-Kar in command, and with him Retallick and Norna. They had much to tell us, but since time was short they told us as briefly as possible. Since we left, the ether had been frantic with signals. The earth stations, realizing that interception and interruption was a game that two can play, had managed to cut in on the Adosian communications. Having no idea of the language, for the plates we had taken from the original sphere had so far defied the combined efforts at translation of the Martian and Tellurian scientists, they were unable to make head or tail of them, but from the staccato urgency of their tone our people guessed that some great movement, probably dictated by a sudden panic, was being mooted. Moreover a couple of space-ships, sent outside the earth's atmospheric envelope, were able with their long-range observation telescopes unhampered by any intervening atmosphere, to make out great activity in the void. Close investigation of the moon showed a constant passing to and fro of large fleets of spheres, and presently they began to concentrate there as though preparing for a desperate stand.

But then suddenly, following on a series of frantic signals cutting across the void, the massed spheres left the moon and disappeared behind it in the direction of invisible Ados. It was reported, however, that on the heels of this the green haze which had now spread like a luminous halo round the moon, had increased in power and intensity.

The International Commission was already considering the advisability of launching into the void such space-ships as were ready when our message came through. It confirmed them in their belief that the Adosians' preparations were nearing a climax and at the same time it gave our folk the one weapon they needed to even up the odds against them. The great Armada, already provisioned and equipped, was immediately launched and additional apparatus hurriedly constructed and stored on board. It remained now only to make a junction with the Martian fleet and stake all on a desperate offensive against the Adosians. The fact that all attempts to interfere with free communication had ceased a little before I had televised the formula, might mean anything or nothing. Perhaps the Adosians had advanced so far that they need no longer hinder us in this respect. On the other hand it was quite as likely that the cessation of interruption had been merely coincidence. A dozen other solutions, each equally plausible, jumped to our minds.

We were given our instructions and sent back to the *Tellus*. A number of mechanics with the new equipment accompanied us, and began setting it up right away.

As we hurtled off to join the oncoming fleet from Mars I questioned one of the men who were to operate the new machines. He was rather hazy, as we all were, as to the exact function of

the green halo surrounding Ados, but he was inclined to think that it was either a power ceiling or a defensive field of force rays. Its nature, purely electrical, had been fathomed, however, and the new equipment was designed to counteract its effects solely by opposing it with force rays of greater power.

I had given little or no thought in the interval to the rest of the Martian fleet. I had taken it for granted that they were following on behind the *Tellus*, though at a much reduced speed. Somehow the sight of the spheres which had pursued us, turning off and heading for Ados, must have given rise to the idea in my mind that the main body was also being recalled. I learnt to my dismay that the reverse was the case when instructions came through that we were to make all possible speed in full battle order.

It appeared that the fleet after assisting me to escape from the ring of spheres had been suddenly and violently attacked by the full force of the remaining Adosians. The entire fleet had narrowly escaped destruction; indeed, three ships were incinerated in the void before a retreat movement could be begun, and it was only when, realizing the odds against them and the hopelessness of attempting to engage the sphere on anything like equal terms, they turned tail and headed for Mars, that the Adosian pursuit showed any signs of slackening. Even then the chase was not abandoned. True, the Adosians made no attempt to overtake the retreating Martians, but they hung on their skirts and herded them towards the red planet in much the same way wolves will herd deer to their eventual undoing. The move probably was purely strategic. The Adosians wished to conserve their forces as much as possible for some effort not yet apparent, and at the same time prevent the fleets of earth and Mars from joining, so as to overwhelm them.

We came upon the spheres suddenly, though no doubt our observing scouts had sighted them long before, a great line of silver beads strung across the firmament and far ahead of them, dim in the infinite distance, the glowing shape of the Martian ships, looking in that vastness like tiny goldfish.

We on board the *Tellus* had anticipated a certain cautiousness in the approach, but Bo-Kar and his colleagues had apparently decided that the impetuous method was the best.

The spheres must have become aware of us about the time we first sighted them, and we were soon shown what their actual battle formation was like. Some signal must have passed between them, for swiftly, as at a word of command, they began milling this way and that, moving for a few seconds in what looked like hopeless confusion. Another instant and the full extent of the maneuver stood revealed.

The entire mass of the spheres had formed into a hollow globe, so that the full force of their rays could be concentrated in any given direction at any given moment!

Another sign I imagined, if one were needed, that the Adosians fully realized they were fighting a losing fight—the old business of a hollow square over again, adapted this time to space conditions, They were, it seemed, no longer prepared to take the initiative.

No sooner was the idea formed in my mind than circumstances combined to shatter it in the completest fashion possible.

A great blaze of rays sprang from the globe formed by the spheres. It was like holding a well-cut diamond up to the light, only infinitely more dazzling. The glare hurt the eyes. It even penetrated our closed eyelids, leaving us blinded and groping.

A warning instinct made me try to draw my eyes away from the vision-plate, and a fascination for which I could not account seemed to be holding me there against my will. But the full realization of the horror that must follow swept over me like a wave and helped me to break the chains of the hideous inaction that held me.

I sprang for the infra-red glasses, yelling as I went for the others to get theirs. Fumblingly I adjusted mine. The blessed, wonderful relief that they gave!

Not content now with torturing our sight, the spheres had begun whirling. Even with our glasses and the lights toned down so that it no longer stabbed our eyes like red-hot needles, we were dizzied and dazzled by the constant motion. It was impossible to see the spheres themselves; so fast were they rotating that they moved inside an apparently solid globe of light. Like quills on a porcupine, little fretful stabs of green began to interlace the design, one every now and then reaching out catherine-wheel-like into space.

I didn't like the look of that. Something was going to happen soon, something that wouldn't be too much to our taste. I looked at Marian, at Spain and Arabella. Something of the tension had communicated itself to them.

The worst of it was that we were forced to inaction, our hands tied. We could do nothing until the flag-ship signalled, and then the result was in the hands of the mechanicians who had come on board recently. A queer kind of war, a battle of lights and invisible forces, annihilation dealt out by the touch of a switch or the turn of a lever. Yet clean and wholesome in one way; it did not leave men torn and maimed; it killed them completely or passed them by.

Came there the tinkle of the televisophonic bell. Our mechanician jumped to it, with an apology to me as he passed for doing so. I said nothing. I was only in control. The actual dealing out of destruction must be left to those qualified to do it.

A splutter of instructions, loud enough for us all to hear them, too technical for us to understand, came through . . . The man acknowledged receipt of them, and came back to us with a smile on his face.

"Massed attack, then open order and hit where we can," he said to me. He might as well have been speaking in Greek.

Sundry queer gadgets had been brought on board from the flagship—box-like, camera affairs, heavy enough for all their lack of size; long deadly-looking cylinders, and other pieces of apparatus all beyond me—and in the interval of traveling had been fixed in various parts of the ship and connected up with a new bank of keys erected in the control-room. The mechanician took his stand over the keys.

"I know what to do, sir," he explained. "Directional orders for the ships will come over the televisophone as long as we can hold communication. You'd better have it tuned up to full speaking strength, if you don't mind me making a suggestion."

I nodded. "Spain," I said, "you take the televisophone to pass on anything I don't get. Marian, I want your help here at control. Arabella . . . well, I don't know for the moment what you can do."

The mechanic looked up with a cheerful grin. "I can do with an assistant," he said. I think he liked the look of the grim set of Arabella's mouth.

"Take her," I said wearily.

Our orders came through almost at that exact instant. Full speed ahead

until we were almost in touch with the green rays. We were not to get within actual reach of them, however.

Our rockets thundered. The mechanic and Arabella under his direction played some sort of a devil's symphony on the clicking keys. A huge red beam from our nose darted out to join a perfect forest of them projected from the other ships. The whole round of the void seemed crimson with the fires of hell. No thing of human construction I thought could exist long in the tremendous heat generated by those rays. Yet to my amazement they seemed to spin off the whirling globe of light as a sunbeam is reflected from a mirror. Or more correctly, as an arrow is turned aside by a shield.

"We'll have to give 'em dido some other way," the cheerful mechanic remarked. "They're not at home to that. I thought we might get near enough to use the Martians' paralyzing ray. The trouble before has been it couldn't be used in the void. Must have something to travel in, like air. But Foster—you've heard of him—found some sort of carrier beam we could use and the deed's done."

He looked in the vision-plate, then back at the bank of keys in front of him. The needle on a little recording dial there was flickering agitatedly back and forth.

"Field of force, sir," he remarked. "You'll notice that globe's turning green now like the haze round Ados itself. Well, we'll have to give them some anti-stuff. The other ships seem to be tuning up, too. I'll trouble you for all the power the generators can give us, sir."

The order went through. The mechanic pressed a key. An instant later the whole ship seemed to quiver; she shook in every part so that I thought she would fly to pieces. The mechanic must have read my thoughts.

"No need to worry, Mr. Harper," he said. "She'll hold all we can give her. All the ships are tested for twice the power we can develop here. We're in the center of a sort of anti-magnetic field, so to speak, and the tendency is for everything to fly as far from everything else as it can. If the ship wasn't properly insulated you would see most things starting to fly asunder. Doesn't seem to have much effect on the spheres so far."

He spoke a moment too soon. As our heads dipped together over the vision-plate, it seemed that the globe of light was dimming. It became almost transparent, so that the massed spheres inside were partially visible. It bent like a pressed bubble, the first intimation we had had that it was an actual, tangible creation; then like a pricked bubble it burst. But probably that was only because the rays that had created it were shut off simultaneously.

Then as we looked the mass of spheres broke apart like ants when an ant-hill is kicked by a boot. Some of them, most of them in fact, those furthest away from us, shot out into the void, piling headlong in full flight. But others, those nearest, which had caught the full force of that first eddy of power, seemed to swell, distended like bladders blown to bursting point, then burst in their turn!

The mechanic was right. Everything in them must instantaneously have blown apart. They erupted in all directions in silent explosions. Only, the back kick of their released gases caught and bounced us miles out into the void.

It was a full hour before our scattered

fleet came together again. Fortunately there had been no casualties. In the meantime our flagship had got in touch with the retreating Martian fleet, and ordered them back to meet us and refit with the new weapons.

The mechanic had the last word, not a cheerful one by any means.

"Well, it worked this time," he remarked. "But I don't quite know that it will again."

"What do you mean?" I demanded.

He brushed his hair back from his forehead with a grimy hand before he answered.

"Seems to me," he said at length, "that if we're going to use power against that green screen of theirs in the same proportion that we used it now, we're going to lose so much force that the Lord knows what it will do."

"In what way?" I asked quickly, with half an idea of what he was driving at.

"This way," he returned, gloomily for once. "You saw what it did to those spheres. Well, imagine it used proportionally strong enough to deal with a whole planetoid."

I gasped at the vision the suggestion conjured up in my mind.

"I see," I said thoughtfully. "Of course it might blow Ados to pieces, disintegrate the planetoid, in fact."

He nodded. "That's not the worst. We don't know what effect it would have on earth or the moon. Besides the back kick, there's the upsetting of the gravitational relation of the three bodies to consider. Probably we'd find the moon drawing closer to earth. You know what that would mean? Tidal waves, earthquakes and general hell to pay."

Certainly by no means an inviting prospect to face!

CHAPTER XXVII

Ados

THE full story of that fateful attack on Ados is not mine to tell. I saw only my own particular section of it, and I can write only of what came under my own notice. But those who would acquaint themselves with the fuller story of that short campaign will find it set out at length in the Book of Warnings, which the new laws of all the habitable worlds now agree young Planetarians must learn to read from their tenderest years. Perhaps in its study they may be taught to avoid those mistakes of fact and errors of judgment that for long prevented anything approaching the unity of our peoples. So much for that.

We were days behind the retreating spheres. We had halted not only to refit the new Martian detachment, but also to overhaul and test every possible working part of our ships. The fate of two worlds depended on our preparedness, and Bo-Kar and his earth colleagues had no intention of proceeding until they had satisfied themselves that nothing human ingenuity could achieve had been left undone.

Well I remember our second glimpse of Ados, that dark surfaced planetoid with its shell of green haze. The latter was brighter and more luminous than when we had last seen it. Our instruments showed that its influence was stronger. The question to be decided was whether as an armor to the planetoid it could stand up against our improved weapons.

We had expected to be met on the way by a host of spheres, a collection of that vast *armada* Ados had gathered for our subjugation, but to our surprise we sighted none. There was a

reason for this, though it did not appear until later.

As a matter of fact I fancy our commander was a trifle nonplussed at the lack of welcome, a trifle puzzled, too, as well he might be. However, since we had grounds enough for adopting the offensive, as soon as we were within the gravitational influence of Ados the vibratory anti-magnetic rays were turned on the screen.

We watched our little section of that world, our hearts in our mouths, mindful of what our mechanic had prophesied, but for long enough, though the drain on our generators grew pronounced, nothing happened.

At last, just when we were beginning to think that the one weapon on which all hopes and fears were centered was going to prove ineffective, the unexpected occurred. The screen shivered a little. It dipped in the center. The luminosity became less pronounced. I think some of us cheered. Someone else gave a cry of dismay. At the very moment, when victory of a sort seemed within our grasp, the tide bade fair to turn against us.

From behind Ados, from that face of it which we had never seen, there came hurtling sphere after sphere in a never-ending stream, thousands of spheres, rounding the planetoid high above us, ravening birds of prey dropping down to overwhelm us by sheer force of numbers. It seemed as though they must blanket us by their own weight and drive us down to Ados to perish.

I know I stood stunned, uncertain what to do, in that instant of surprise. The mechanic, gunner, electrician or whatever he cared to call himself, was in no such pass. He whistled cheerfully, shouted some sort of orders to Arabella, and went to work banging at the keys himself.

A dead-white ray leaped vertically from our nose, reached up and stabbed into the middle of the descending spheres, then came another and another until the sky above us appeared roofed over by them. We could see the spheres through them, staggering and reeling, the undermost ones at any rate, pitching and tossing this way and that.

"Control, Mr. Harper," the mechanic shouted abruptly. "They'll be on us if we don't watch out."

It was true. The lower spheres, completely out of control, were falling directly towards us. They were falling slowly, however. I fancied from the look of things that their gravitational screens were still running automatically, and until the power governing them ran out they would flutter down rather than fall.

It was now more or less each ship for itself, and in the absence of specific orders I did what I thought best. We easily cleared the lower spheres, but the others above were still under control. The dead-white carrier ray of our paralyzing beams had not reached them. But they could not get at us because of the blanket of their own craft.

The moment we emerged from that blanket, however, they began to strike at us with their green rays. The trouble with them, though, was that their action was not instantaneous. It took a couple of seconds for the green pencil to reach out and heat up its objective to the point of incandescence. On the other hand, our paralyzing ray, on which we preferred to rely at this juncture rather than on the red heat beams, acted at once. The carrier took them right through the outer shells of the spheres, through the vacuum space between, and through the inner shells, plunging their crews into a state of coma instantly.

We did not have it all our own way. Every now and then a green ray clinging tenaciously to a planetarian ship

sent it off in a burst of incandescent dust. A number of other ships were damaged seriously by the repercussions of the bursts.

By some miracle of chance we and some half dozen other ships presently found ourselves unscathed, high above the conflict, only a few isolated spheres being on the same plane. But they seemed to be out of control, for they were drifting aimleslsy about. One I noticed particularly. Something had started it rotating and as it swept round on its own axis, the green ray, like a stained finger sticking out from it, whirled round and round, too.

The spheres beneath us were less massed now. We could see Ados, could see, too, that while a section of our fleet was engaging them, another section was apparently training the anti-magnetic power on the planetoid.

The green haze dipped and swayed alarmingly. Its high lights had died almost completely away, though every now and then like the embers of a burnt-out fire, they flared for an instant to life again. Yet the force rays generated by our fleet were gaining.

Mindful of what the mechanic had said, I watched fascinated. I had nothing else to do. We were merely hovering now, and the mechanic was doing the work, sending paralyzing ray or heat beam stabbing this way and that as the opportunity offered. So it was that I saw a section of that last act of the drama.

Of a sudden the green haze screen, a gigantic bubble, swelled to enormous proportions, became so tenuous that one could see through it, and abruptly vanished as though it had never been. For a moment the planetoid seemed to rock, then a great blast of air roaring upwards into space drove through the spheres and inter-planetary ships alike, scattering them like chaff before the wind. We, in the *Tellus*, seemed to be thrown every which way at once, but luckily none of us were hurt. I picked myself up at once and jumped to the control, afraid that we would be hurled up against the under surface of the moon and dashed to pieces. But the blast had not been strong enough for that, and, as I got the *Tellus* back on her course, and started to descend to our former level, I saw that others of our ships were being brought about in their turn.

But Ados seemed different as we drew near it. The green haze was gone. We were looking down on a bleak, bare world. I think I jumped to the right conclusion then and there. Afterward some of the spheres were captured, and since they still contained air some of the crews were alive, though in a state of temporary paralysis. They were the only live Adosians we saw. The value of their capture, however, lay in the fact that we put the Martian thought machines on them and thus obtained enough information to supplement what we discovered of our own accord.

Ages ago, it seemed, Ados had an atmosphere, but like the moon its air eventually began to escape into space. The Adosian, being a slothful enough creature, apparently was content as long as science found a means of retaining that atmosphere. The difficulty was solved by the production of a power-ceiling extending all over the planet. Air, water and food were made synthetically as natural supplies failed, but it was not until with the passage of long centuries the natural elements from which the synthetic products were made began to fail, that the Adosian bestirred himself sufficiently to look for an alternative to the extinction that faced the race. Frantic experiments covering a period of about eighty or ninety of our years culminated at last in the construction of the progenitor of the present

spheres. They were extremely clumsy, however; the first ones that went out were lost in space, but spurred on to further efforts by the threat of doom hanging over their heads, the Adosians at last evolved a reliable article. Then began exploration. Earth, as the nearest habitable body, offered them exceptional advantages. The difficulty of increased gravity there could be overcome artificially and probably the race would sooner or later evolve a type that could stand the gravitational pull of the planet without any undue discomfort. That, at any rate, was their theory.

It was a desperate chance the Adosians were taking, and they put long years of preparation into their work before they dared make a move. And then at the last, when they seemed within measurable distance of making their one ruthless stroke, the uncounted factor of the Martian conquest of space appeared to upset their plans. They had to proceed more slowly and more cautiously because of that, for quite wrongly, as we know, they sensed in the Martians rivals for the possession of earth.

The power curtain was charged with those repelling influences that made it an effective armor for the surface of the planetoid, and under its protection preparations went forward on even a vaster scale than before. But for that lucky accident of Bo-Kar kidnapping us, the Adosians would probably have succeded in subjugating earth first and then the other planets in their turn.

* * * * *

WE came down to the surface of Ados after the battle, but it was impossible to venture forth without the protective space-suit equipment. The mechanic had been wrong when he had asserted that the force beams we had directed against the green screen would shatter Ados as they had shattered the spheres. He had overlooked several vital facts. The spheres were hollow bodies with an atmospheric pressure inside of roughly about fifteen pounds to the square inch and the vacuum of space outside. The walls of the spheres, however, had been built to withstand that pressure from inside and stand rigid under a force that constantly strove to split them asunder. The effect of our force beams was to press the walls of the spheres inwards against that pressure, and in pressing them relentlessly it weakened them so that they simply flew to pieces. Ados, on the other hand, was a solid body. Our rays were not likely to shatter it as they had shattered the spheres.

But one effect they had that no one seems to have counted on. Under their influence Ados rocked and was pushed back and then forward a little. But Ados was moving with the earth and moon in an orbital path round the sun. The force of that revolution as opposed to the gravitational pull of the sun, kept it in a state of equilibrium. The momentary push of our force rays merely made it behave like a coiled spring under pressure; the moment the pressure was released it sprang back to its original position.

But one cannot interfere safely in the slightest degree with the forces of Nature, and in that sense the mechanic had been right in his surmise. There were earthquakes and tidal waves on earth, much damage was done and many lives lost. That was the price we paid for our future security, not so great a price as the Adosians paid for their attempted invasion of our planet.

With the exception of those few recovered from the spheres in a state of coma—they were taken to the earth and for some years were objects of interest there until the last of them pined away and died—the whole of the

population of Ados died suddenly and violently the instant our force beams succeeded in puncturing the green haze that hung like a protecting shell over the planetoid. As the haze exploded into nothingness, the atmosphere beneath rushed out into space—that was the blast which hurled us upward—and the eternal cold of the void rushed in. It was a lifeless, frozen world on which we descended some hours later.

It is not my place to tell here of the wonders we found. Even a sketchy account would fill a volume. Interested readers of adult age will find them fully set out in the Book of Warnings. The youngsters are only too familiar with them already. But even the Martians admit they can learn much from the Adosian records, many of which we have at last succeeded in translating, and already we are adapting for our own use some of the powers the scientists of that planetoid discovered for themselves.

Some of us, looking back now, do not care to think of how, through accident rather than of set purpose, we wiped out a world, even though we realize it was we or they. But I myself think that good may eventually come out of it, if only that it has taught us the full horrors of inter-planetary warfare, where quarter can be neither given nor received. I do not believe that after that lesson we people of the inner planets are ever likely to quarrel with each other, and I hope with all my heart that we may never see the launching of another terror out of space.

THE END

Dr. Grimshaw's Sanitarium

By FLETCHER PRATT

Many of the functions of the human organizations are subject to great beneficial or unfortunate effects from the operation of the ductless glands. Some affect the growth, making a man large or small. Many cases of gigantism are due to the pituitary gland, so that a circus giant may be looked upon as abnormal, independent of his size. We are only at the beginning of the appreciation of the functions of the mysterious glands in the human system and operations on the size of human beings may yet enter into regular medical practise.

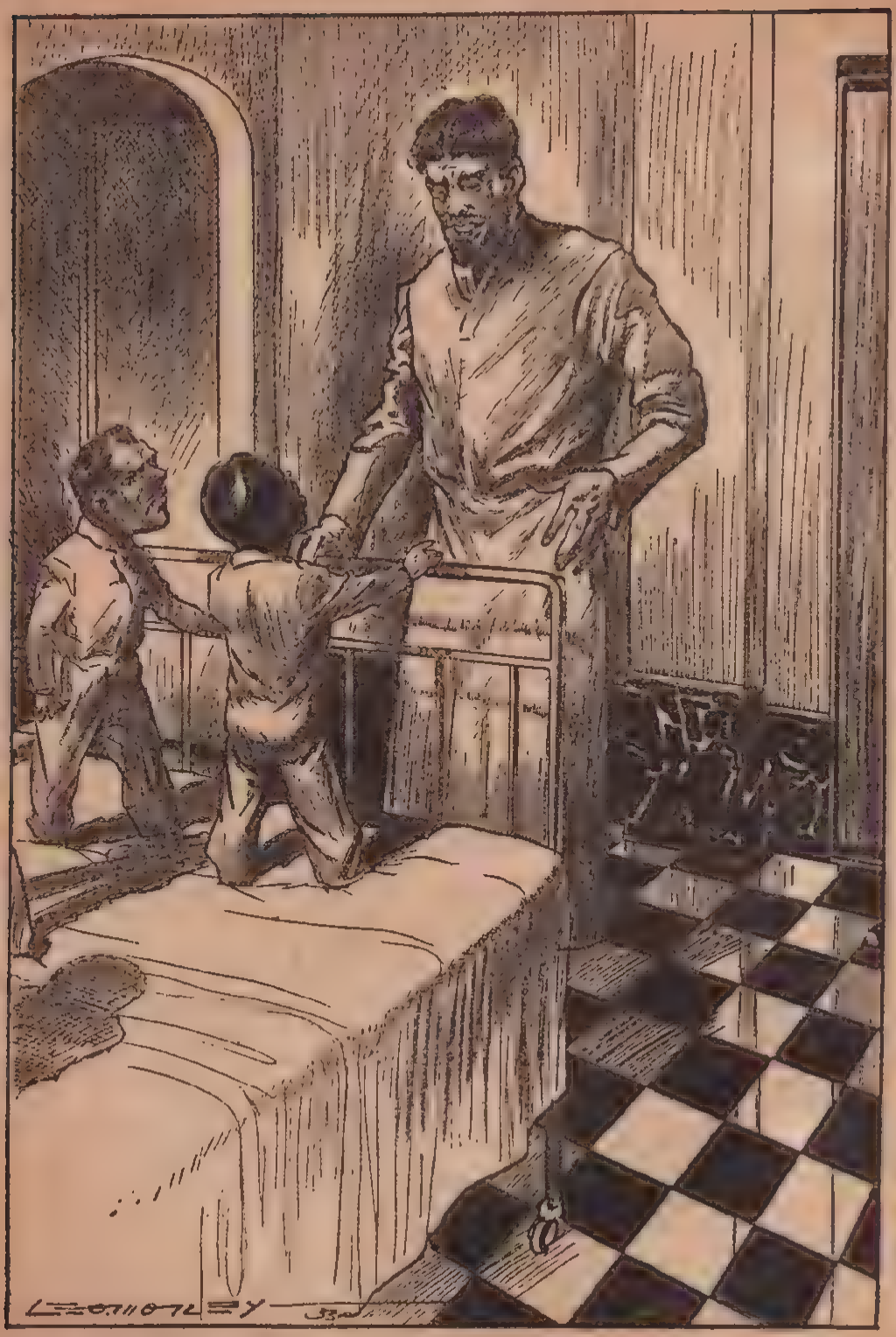
Illustrated by MOREY

NOTE by the editors: The following manuscript is one of the results of the famous Grimshaw Sanitarium scandal, an event which in its day, made a tremendous stir, cost a state superintendent of hospitals his post, and turned the course of an election. But every state has its scandals of this type. It is seldom that their reveberations extend beyond the immediate locality; and for the benefit of those who have not heard of or do not remember the Grimshaw case, we will briefly rehearse the known facts.

Dr. Adelbert Grimshaw, a physician of German extraction, opened a private sanitarium for nervous cases at Gowanda, near the grounds occupied by the State Hospital for the Insane. It was a very select institution, catering to the wealthiest patients, and the high fees Dr. Grimshaw secured from them enabled him to establish a charity ward in which, with admirable public spirit, he labored to improve the condition of the indigent feeble-minded.

Dr. Grimshaw appears to have effected some remarkable cures in insanity cases; several well-attested instances of complete recovery from paranoia are recorded under his ministrations. At the same time it was noted that a good many patients died at his sanitarium, and later investigation revealed that these belonged to two classes—wealthy patients whose relatives were at a great distance, and both poor and wealthy patients who had no relatives at all.

It was the case of Harlan Ward that led to the scandal. This unfortunate young man, the son of the famous automobile manufacturer, was committed to Grimshaw's sanitarium by his parents and wife in the autumn of 1927 in an effort to cure him of the liquor habit. He was duly discharged as cured some eight months later, but about a year after his discharge it was discovered that he had begun to take drugs, and he was returned to the institution. Some time after this, while his wife and parents were in Europe they received a cablegram from Dr. Grimshaw announcing the death of the young man. They at once returned to the United States and made arrangements for the removal of



He looked down at us with a kindly smile for a moment, and then began to shout. His voice was so extremely loud and deep that I had no little difficulty in understanding what he was saying.

the body from the place where it had been temporarily interred at the Trinity (Episcopal) Chapel of Gowanda to the family vault at Short Hills, Long Island. While passing through New York City, the hearse carrying the casket was struck by another car. The hearse was overturned and the casket broken. It proved to contain, instead of the body of Harlan Ward, a dummy dressed in his clothes and stuffed with sand, the face being represented by an ingenious wax mask.

There was an immediate investigation, in the course of which many facts came to light. The most striking of these was that in nearly every case of patients, whose death at the sanitarium had been reported by Dr. Grimshaw, the body was similarly missing, and a sand-stuffed dummy was substituted in the coffin. None of these bodies has ever been discovered. The death certificates had all been signed by Dr. Grimshaw himself.

This sensational discovery was followed by the arrest of Dr. Benjamin Voyna, Grimshaw's chief assistant. Papers found in the safe of the Grimshaw Sanitarium showed beyond doubt that it had been made the headquarters of a gang engaged in distributing narcotics, and that both Dr. Grimshaw and Dr. Voyna were deeply engaged in the traffic. It was undoubtedly at the sanitarium itself that Harland Ward had contracted the drug habit that proved his ruin.

Of the other facts uncovered by the police there were two of such singular character that the present manuscript appears to afford the only adequate explanation for them, however fantastic it may seem. One of these was that while running a sanitarium and a drug ring, Dr. Grimshaw apparently found time for the breeding of large numbers of cats. Over thirty were found in and about the premises by the State Police when they raided the place. The other, and more extraordinary fact, was that Dr. Grimshaw, through a chain of agents, seems to have been engaged in the peculiar business of supplying circuses and vaudeville impressarios with dwarfs.

Most of these midgets (as is not unusual) were morons, and many of them were both drug-users and drug-peddlers.

Dr. Voyna ultimately received a jail sentence of five years; the heaviest allowable for dope peddling under the laws of the United States. Grimshaw was never apprehended. Warned no doubt by the first newspaper accounts of the bursting of the Ward casket, he took to flight and has not been found since. If he is ever arrested it is doubtful whether any charge but drug-peddling will lie against him. The laws of New York require that a body shall be produced before a charge of murder can be substantiated, the *corpus delicti*, and as we have stated not one of the bodies of his victims has been found. Investigation of the doctor's past career showed that he had been a graduate of Heidelberg and Jena where he took high honors in endocrinology, but that he later lost his German license on account of malpractice. His original name was Grundhausen.

As to the present manuscript. When the State Troopers raided the Grimshaw Sanitarium they found it nearly empty. In the search for incriminating evidence, which followed, one of the troopers found three gelatine capsules in a corner by the fireplace in the reception room. He dropped them into his pocket and forgot about them until some time later. When he examined them, he found they contained something white. Imagining it might be drugs of some kind, he turned them over to the State Medical Examiner.

The Medical Inspector opened one of

the capsules and found that it held a small wad of exceedingly thin paper, apparently cut or torn from the edge of a thin-paper edition of the Bible. He noted that something was written on the paper in minute characters. With the aid of a microscope, he was able to decipher the writing, which was finer than anything but the finest known engraving. Like the first, the other capsules contained strips of paper, and when the whole had been deciphered and arranged in its obvious order the following manuscript resulted. It will be noted that there is a gap in the story, representing, probably, another capsule which has not yet been found.

INTO whatever hands this may fall, I pray to God that the finder will lay it before the police at the earliest opportunity. I herewith lay a complaint that Dr. Grimshaw is engaged in the drug traffic; Dr. Voyna, his assistant must be involved also.

I fear that in spite of my precautions this will fall into Grimshaw's hands; if so, it will only provide that good doctor with a view of how he looks to other people—Sherman and Kraicki, Arthur Kaye and myself. Dr. Grimshaw, we salute you! Behold your mirror—a mirror set in a skull, as it were—for we speak to you as men already dead. And you, unknown finder and reader of this last testament of a dying man, if you be not Grimshaw himself, will you do me the last favor that even the condemned of the scaffold may ask? A small thing—merely to inform Miss Millicent Armbruster of 299 Wallace Avenue, Buffalo, that John Doherty is indeed dead.

Then put the police on the trail. The officers will no doubt be skeptical—ask them to make an examination of the coffin that supposedly contains the remains of Arthur Kaye.

I may as well start my story at the beginning, lest I be taken for one of the sad souls that infest this place, merely maundering under a delusion of persecution. I have no such mania; neither am I one of the dipsomaniacs and drug-fiends kept here for "cures;" strangely ironic word. My name is John Doherty; I am a graduate of Hamilton College, class of '16, a member of the Theta Alpha fraternity, and a detective by profession. I was led into the business by a certain taste for romance and a physical development that caused me to become a member of most of the athletic teams at college.

I had been working for the Pinkerton agency for some time when they sent me as additional guard with a money shipment from Buffalo to Philadelphia. The messenger in charge of it was suspected of double-dealing. It was essential that extra protection be provided, and I was locked with him in the baggage car. The journey was a long one, the motion of the train soporific. I suppose I dozed; I was wakened by a flicker of motion as the messenger drew his gun, and we both fired at practically the same moment. My bullet killed him; his just grazed my skull, rendering me unconscious.

When I had recovered from the injury, I found some difficulty in concentrating enough attention on my work to do it properly, and my employers, as a matter of gratitude, decided to send me to Dr. Grimshaw's Sanitarium, which had already achieved a considerable reputation through the remarkable success of the doctor in handling just such cases.

I was received with extreme courtesy, subjected to a searching series of inquiries as to my tastes, habits and past life, and then given a series of tests that were readily recognizable as modified Binet-Simon examinations. It seemed rather unnecessary, as a man with a

college diploma is supposed to be beyond that sort of thing, I fancy, but I made no comment, imagining that Dr. Grimshaw knew his business. He did—to my infinite cost.

At the sanitarium I was given a pleasant room and very little by way of occupation. I was kept in at all times save during meals and for a short period in the afternoon, when all the patients were taken for exercise to a large park or garden, with a small stream running through it. During this period I encountered Arthur Kaye, a large man with a high forehead, who was under treatment for dipsomania; a man named Kraicki, a decayed Polish aristocrat of a sort who was troubled apparently with a chronic weak-mindedness; Sherman, the interne in charge of our wing, to whom I felt considerably drawn by common tastes in literature and art.

There was little to do in the park but to sit and talk with these three. We formed a more or less self-sustaining group, somewhat separated from the other patients and internes about us.

For a time, we attempted to amuse ourselves by playing bridge, but this resource proved futile. Kraicki was totally incapable of keeping his mind on the game, and would ask the most absurdly naïve questions about what he should do when he held four aces. Naturally, the enforced idleness began to become somewhat wearisome. I am of an intensely active temperament, and have led an active life, and I began to cudgel my brains for something to do. Even a covert breaking of rules struck me as a fascinating occupation; at least it would provide me with something to plan and accomplish.

Searching about for a rule to break in the most interesting way, I hit on the problem of the wall. At the left side of the park a high stone wall separated our bourne from that where the charity patients were confined. Sherman remarked one day that nobody but Grimshaw himself, and his leading assistant, Voyna, were allowed beyond it, and the building in which the charity patients were kept was only connected with the main body of the sanitarium by a kind of covered passage. To get over that wall and solve the mystery of the seclusion of the charity patients—that would be an enterprise worthy of accomplishment.

So one afternoon, just before we were called for the regular period of exercise, I arranged a dummy in my bed. After the exercise period, as we emerged from the dining room, a more or less disorderly group, I slipped around a corner into the operating room and waited behind the door till the attendants, who brought up the rear of the procession, had passed, then back into the dining room, and out one of the windows into the park again. There I concealed myself in a little group of maples by the edge of the stream until darkness came. I knew the night attendant in the halls would flash his lamp through the peep-hole in the door of my room, but trusted to the dummy (as I have many times done in detective work) to deceive him.

After the lights in the building went out, I searched along the wall until I found a tree growing against it, scaled it with some little difficulty and dropped down on the other side. I found myself in another exercise yard—not so large nor so well carpeted with grass as ours, and without the stream. It was entirely shut in by a lofty wall, crowned with spikes on every side save that where I came over.

The windows of the charity patients' building were barred like ours. Thinking myself more or less of a fool and my adventure a rather paltry one, I tried the door, more to assure myself of the impossibility of entering than for

any other reason. To my surprise it was unlocked. In the lower hall, there was a single dim light, but the building was silent save for a subdued moaning from somewhere upstairs. The maniacs who formed Dr. Grimshaw's more serious cases were usually making some noise of that sort, so I gave the matter no thought.

I was about to try the upper floor to see what I could observe through the peep-holes, when I heard the grating of a key in the lock at the end of the covered passage. The outer door was too far away to be attempted with any prospect of success. I must find concealment, and quickly. Fortunately a large clothes hamper stood in the hall . Into it I leaped, and by the grace of the gods, found it empty save for a couple of towels. Through its sides I could get a somewhat imperfect view of the hall, and I saw that the newcomers were three in number—Grimshaw, Voyna and a boy of about twelve, I should judge.

They passed me so closely that their clothes brushed my place of concealment, and they turned on the light in the room by whose door the hamper stood. I was unable to see what they were doing, but Grimshaw's voice rose sharp and clear:

"You'd better be reasonable and take your medicine. It will relieve the pain."

A second voice replied, "But I won't take it, I tell you. I know what it is, it's dope. You can do what you like; you made a midget out of me, but you ain't going to make no dope fiend out of me."

The voice was neither Grimshaw's nor Voyna's; I had heard both often enough. It must therefore belong to the boy, and then the startling connotation of the speech struck me—it was no boy but a dwarf or midget.

"You won't take it, eh?" said Grimshaw, with a kind of suppressed fury in his voice, "I'll show you!" and I heard the sound of a blow.

"No I won't," said the voice, rising near tears.

"Wait a minute," (this was Voyna speaking) "That's not the way, Grimshaw. You can't bully these Americans. Show him how much he will gain by it. Look here—you take the medicine the doctor is good enough to prescribe for you, and in a short time you will not only be well enough to be discharged, but we will find you a position in which you will make more money than you ever saw before."

"You go to hell," said the third voice (it had a singularly boyish timbre that touched me) . "I won't take your dope and won't peddle your dope. Look at Tony Gasbotta. He's peddling dope—" his speech was broken by the sound of another blow, and somewhere, one of the maniac patients began to shout.

"Shut the door, will you, Ben?" said Grimshaw, and that was the last I heard.

My muscles were cramped by the confinement, but I lost no time in escaping from the hamper and the building. I wondered whether they had been giving me drugs in my food; how many of the sanitarium's employees were in on this business; and what lay behind all these sinister manifestations. "You made a midget out of me"—what could it mean. I judged, however, that Sherman was honest enough, else he would have been admitted to whatever grisly secrets the charity building held. As to habit-forming drugs in our food, I was not so sure, but it didn't look like it, if they had to coerce the dwarf into taking the dope. And then, the whole thing might be the result of a maniac's imagination. I had no guarantee the dwarf was sane.

Nevertheless, I slept beneath the trees that night. I feared that I might run into Grimshaw or Voyna in the halls, and if they were actually engaged in any such shady business as it seemed,

such an encounter would be dangerous to the last degree. In the morning I entered by the same way I had left the building, hid in the operating room again, and joined the crowd at breakfast, after which I went to my room and destroyed the dummy. Just what to do was a problem, but I reasoned that Sherman would tell me better than anybody else what lay behind it, for even if he were not involved, he could add much corroborative information to what knowledge of the events I had. If he should prove one of the gang, then I must trust to strength and speed to escape.

That afternoon, during the exercise period, I told him the whole story. Kaye and Kraicki hung around and heard it too—somehow I couldn't seem to get rid of them.

"My God!" said Sherman, when I had finished, "So that's why . . ." and he stopped.

"That's why what?" I asked.

"Why no one but Voyna is allowed in the charity wing or on the third floor of this building," he said. "I always thought it was queer."

"But are you sure they're not putting drugs in our food?" I asked.

He gave a little laugh. "Hardly possible," he said. "There are too many people here and too many visitors. No, that would be crude. Moreover, there are too many internes here. Someone would be sure to notice the taste. It is very characteristic."

That was a relief, at all events. As to the question of whether Grimshaw and Voyna were actually engaged in the drug traffic, Sherman seemed not quite certain, but judged that the best procedure would be to certify me cured, get me out and let me return with search warrants and police and check up on that mysterious charity ward. Leaving the problem at that point, we went to dinner.

The table was unusually quiet that night, and I imagine it must have grated on Kraicki's rather frayed nerves. At all events, before any of us could check him, he burst out with

"I know what's the matter. They're all mad at you, Dr. Grimshaw, because you peddle dope." I slid a plate to the floor, where it broke with a crash, but it was too late—my action only served to emphasize the indiscretion of the speech. Grimshaw darted a sudden look at us, and making some excuse, left the table. Trouble was in the air.

After the meal, the doctor summoned Kraicki to his office. I knew things would very likely be stirring that night, so I did not even bother to undress; merely turned out my light, and waited by the door for what was coming.

Sure enough, along about one o'clock, the door creaked slowly open, and a hand holding a flashlight was extended through the aperture. I snatched the wrist, pulling the holder clear in and off balance with my left hand, at the same time striking out with all my force with the other hand. My blow struck full in the intruder's face and he went down as though pole-axed. But Grimshaw had been fully forearmed. As the first man went down, a second gripped me by the knees, and when I bent to care for him, a third leaped on my back. I put up a good battle, but they were too many for me. They got me down and strapped tight, and not till then did someone turn on the light. I saw Grimshaw standing over me, dabbing a blooded mouth with his handkerchief.

"So!" he said, and I could not but admire the man's calmness. "You have delusions of persecution. You imagine I am trying to give you and other patients cocaine. I am afraid my treatment has not been altogether successful

in your case. You will have to take another treatment—a long one, Mr. Doherty." He looked incredibly benignant. I began to speak.

"Come, come, don't excite yourself. I'm going to give you something to quiet your nerves," he said, and flashed out a hypodermic with which he proceeded to give me an injection.

I lost consciousness under the effects of the drug, and when I recovered it was morning. I woke in a different room; it must have been on the third floor, the forbidden floor, for I could see the tops of trees beyond the barred window.

I was kept there for a long time; just how long I am uncertain for I lost all count of the hours. During most of the period I was in a straight-jacket, and once I was operated on, somewhere at the front of the skull, for I recollect my head being held firmly in a plaster cast after the operation, and an infinite feeling of nausea as the effect of the anaesthetic wore off.

Every day a rough looking chap fed me from a spoon, and every night Grimshaw returned to give me another hypodermic injection. I felt terribly ill and depressed all that time. In the morning I would wake with a blinding headache that would last out the day, leaving me weak as a kitten. I began to develop hallucinations, too. The room seemed to grow perceptibly in size, and the strait jacket became looser.

One day, when I felt better than usual, I made an attempt to wriggle out of the now thoroughly loosened straight-jacket. It succeeded, and I lay still on the bed in a mood of profound self-congratulation. When Grimshaw entered I would rise and strike him to the floor—a poor revenge, but better than none. And there was always the chance of getting past the opened door, out and away.

But all my dreams came to nothing. I was so weakened by long confinement and pain that he handled me as though I were a child—and here, again, I noted a curious thing. He seemed at least a head taller than I; and I am a six-footer. How could that be? Drugs were the only explanation I could fit to it at the time.

The period succeeding this futile attempt to escape is all a haze for me, shot by macabre impressions. I remember once being taken out on the balcony for air, and once imagining that I saw Kaye on the next balcony, muffled in a straight jacket even as I was. But there could be no certainty, and the muffled figure did not speak. And the dreams!—the dreams! I imagined myself as light as a feather. Great giants wandered about my room with huge weapons in their hands; hideous creatures.

My first clear consciousness was when Grimshaw told us all about it. One night the evening meal was not followed by the usual injection and the morning brought the first surcease from pain in—God alone knows how long. I woke with my eyes on a ceiling that seemed miles overhead, and when I looked at the foot of the bed it appeared to have retreated to an infinite distance. The room was gigantic. . . .

Grimshaw came in a moment later. He carried a bundle in his arms, and to my wondering eyes, he looked fifteen feet tall. He came right over to the bed, and deposited his bundle there, and with infinite astonishment, I saw it was Arthur Kaye, that big man with the high forehead, yet small enough to be carried like a baby by a Dr. Grimshaw grown titanic in size. A few moments later the doctor returned with another bundle and then a third—and they contained Sherman and Kraicki, as the first had contained Kaye.

He looked down at us with a kindly smile for a moment, and then began to shout. His voice was so extremely loud

and deep that I had no little difficulty in understanding what he was saying, but I set it down as nearly as possible:

"Allow me to congratulate you four gentlemen. You are the subjects of a classical experiment—one that will undoubtedly place me in the front rank of the world's endocrinologists, and will hand your names down to posterity.

"You, Dr. Sherman, will have already understood the nature of the experiment I have performed. To the rest I must offer a few words of explanation, suitable to their somewhat limited intelligences. There are certain glands in the body, gentlemen, which are called thyroid, parathyroid and pituitary glands. They are known as the ductless glands and have no obvious function. But it has been discovered that if the pituitary or thyroid glands of a young animal, say a sheep or dog, are destroyed, the animal will be a dwarf; in other words, these glands in some way unknown to most scientists, control the growth of the animal.

"Investigation has also shown that an injured pituitary or thyroid gland in the human individual produces equally curious results—giants, seven-footers seen in circuses, being the product of insufficient gland activity. Even in adults these glands are known to produce certain effects. Dr. Haussler has recorded how an abnormally active pituitary gland caused a man's fingers to become short, wide and stubby, long after he was fully grown.

"These endocrine glands cause their changes by releasing certain substances into the blood stream, among them being various enzymes or yeasts, which by a complicated series of chemical reactions bring about the changes indicated. I have given my life to the investigation of these glands and their enzymes. It will gratify you, Dr. Sherman, to know that I have investigated over three hundred cases of dwarfism and giantism, making elaborate blood and X-ray examinations. In time I became convinced that a certain enzyme, which I call "Theta" was responsible for all known cases of dwarfism. I have isolated enzyme theta and found that a normally active pituitary body secretes and releases a counteracting enzyme to it, thus preserving the balance of the body. It then became a question whether I could produce artificial dwarfism by damaging the pituitary body and introducing enzyme theta by subcutaneous injection.

"Animals did not give satisfactory results. Hence I was led to establish the charity ward of this sanitarium and, for experiment, secured a number of feeble-minded human specimens, whose absence would not be noted. I have succeeded in producing midgets as small as two feet ten inches in height by this means. Unfortunately it was impossible to release them into the world as normal midgets, the civilization of this country being so backward that scientific investigation of a man as an animal is actually punishable. Therefore I have introduced these midgets to the delights of cocaine and maintain my control over them by furnishing their supply of it.

"But with you gentlemen I decided to conduct the experiment on an altogether higher plane. You are already so familiar with the details of my business that I could not release you, even as cocaine addicts. Consequently, I have decided, by carefully graduating the dosage of enzyme theta, to produce in you a series of hyper-midgets. In the cases of the charity patients death always resulted from such attempts; but they were mostly in poor physical condition and their mental weaknesses were such that cerebral collapse supervened. You however, are not feeble-minded, with the possible exception of Mr. Kraicki, you are in excellent condition. You show none of the

deleterious effects that have ruined my experiments with the charity patients, and I shall proceed until I have reduced you to a size at which you will no longer be dangerous or until your death puts an end to the experiment.

"Your chances of survival are greatly heightened by the fact that I have produced artificially a second enzyme, which I call enzyme omicron, to supplement enzyme theta. Both of these substances are secreted in small quantities by the hitherto little investigated gland located——

(At this point occurs the distressing lacuna in the manuscript, a fact doubly unfortunate, since it deprives us of the opportunity for a scientific check on the extraordinary statements of Dr. Grimshaw as reported by Jack Doherty. The other details of Mr. Doherty's tale have been in part confirmed by subsequent research. A Pinkerton detective bearing the name of Dougherty was committed to the Grimshaw sanitarium in the early part of 1922. There was also a man named Arthur Kaye there at the same time, under treatment for dipsomania. The names of Kraicki and Dr. Sherman have not been traced. The deaths of Doherty and Kaye were reported by Dr. Grimshaw at widely separated intervals; that of Doherty in 1923, that of Kaye not till March, 1924. A Miss Millicent Armbruster did live at the address given by Doherty; the city records show she married a man named Kellett in October, 1922, after which all trace of her is lost.

When the story begins again, with the contents of the last capsule, it is evident that the experiment has entered its final phase and that Dr. Grimshaw had to a degree lost interest in his four patients. It begins as it broke off—abruptly in the middle of a sentence.)

—stumbled over a grass root and we had to stop for him. The grass was forest-like in its density, and if he had not waited I doubt if we would have found him again. The beetle escaped, and thus we missed a meal that night also. The garden was still too far away to be made in the dark and Kraicki was too done up to go much further; moreover once at the garden our problem would only be transferred, for we would have many wanderings to make before discovering anything small enough for our feeble efforts.

So we camped in a tuft of grass like Malays, taking turns at watching through the night. It was bitterly cold; the piece of bandage was so rough it rasped the skin and the three asleep had to use all the silk for coverlets. Every time I blundered into one of the grass stems it would drench me with icy dew, like a shower bath.

In the morning Kraicki, always weak and unstable, became so feebly insistent on not moving before he had had food, that we fairly had to drag him along. An hour's wandering brought us to a rotting twig that promised well as fuel. We pulled some of the decaying fibres loose and burdened ourselves with them. They would be handy to make a fire with, provided we ever found anything worth cooking over a fire. As for the method, there was always the possibility of striking a spark from a pebble with the piece of watch-spring Sherman had found the day before.

A little further along Sherman, who was then in the lead, shouted. We hurried up to find him standing over a June-bug, which was lying on its back, kicking feebly. I attacked the insect with a piece of watch-spring, but it was no good. His shell defied my best efforts and I received a nasty scratch on the back from his barbed legs as I tried to slay him. Sherman suggested we turn him over and work under the wing-cases, but I was afraid he would crawl away before we could accomplish any-

thing, and our final decision was to build a pyre over him and cook him as he lay.

Striking a spark from a stone may be easy to those who are familiar with the art; for me it was agonizing effort. When we did get our fire going, the heat excited so much activity, on the June-bug's part, that it kicked over our pile of wood and we were back where we had started. After that Kaye and I hunted up a pebble of some size, and heaving together we managed to smash the animal's head in. There were a few convulsive motions after that, but for the most part he lay still, and we managed to get the fire going in good shape.

The meat in the legs, just where they swell out before joining the body, is the best; not unlike crab-meat to the taste. Inside the body the meat was not so thoroughly cooked and very fat besides. Kraicki was the only one who would eat it.

By the time we had finished with the June-bug it was already late afternoon. The conference we held decided against pushing on to the garden. There was a good deal of June-bug meat left, and we had before us now the problem of shelter rather than that of food. There was also the question of weapons, though I solved this to some extent by worrying loose the wing cases of the beetle and splitting them down with the watch-spring. Properly sharpened on a stone, they made not inefficient poinards; rough, but good enough to attack insects with.

Kaye, who was a bit of an antiquarian, essayed making a sling with the aid of some tough grass fibres. After considerable practice, he became quite expert with this ungainly weapon. With tiny stones for ammunition, he could knock flies off distant grass-blades almost every time—an interesting but impractical feat, as after the first attempt, none of us cared to try fly-meat again. The odor alone is enough to turn the stomach. Once he did succeed in slaying a bee, however, and we got some valuable food from it, and about a week later, Kaye and his sling removed from our path a very grim and ferocious-looking spider that we all hesitated to approach.

Our main difficulty was clothing. Sherman offered the idea of working around toward the park where we could perhaps come by a handkerchief or something of the sort. He pointed out that the numerous trees would constitute an advantage, both in offering us ample fuel and a place to live under the roots, and there was a possibility of getting small fish out of the shallower reaches of the creek.

It took us over a week to make the long march, but when we had accomplished it, we were repaid for all our labor. At the border of the stream we found a chair that one of the internes must have left behind, and with it not only his medicine case, but a book, some writing paper and a bottle of ink.

This was treasure-trove indeed. Kaye and I hammered away at the catch of the medicine case for half an hour with the biggest stone we could lift, and finally managed to get it open. Beside various oddments of no utility to us, it contained a bottle of quinine capsules, which were just what we wanted. Once the quinine had been emptied out of them, they made ideal general carryalls. The bottle we succeeded in breaking, and with the sharp glass and a good deal of patience, fashioned useful tools and weapons.

I thought it would be worth while to write some kind of a record, as long as the gods had thrown the bottle of ink and the paper in our way, and with the aid of the others managed to roll the ink down to the headquarters we presently established under an arching tree-

root. The paper was a wash-out, however. It was too heavy and the beetle's leg, which was perforce the only pen I had, too scratchy.

By this time it was full day, and we were running chances by going back to the things the interne had left, but the gain was worth the risk, and I made another attempt. By great good fortune the book was Brinkley's "History of Japan—india paper. With Sherman's help I got a couple of the fly-leaves loose, and he had gone off with one when I looked up and saw the menacing shape of a man in the distance—Grimshaw, I thought, though from his height and the distance, I could not be certain. Leaving the paper behind I fled.

I doubt whether I would have written this record even then but for what has happened since. We were comfortably domiciled under our root in the park, living off grasshoppers (of which there seemed an unending supply) and making preparations for the winter. Once we even caught a mole, stabbed it to death with our glass swords, and skinned it laboriously. It furnished us both good food and clothing. Sherman developed uncanny skill with such poor needles as we could contrive, and even Kraicki contributed to the general fund of welfare by the discovery that the yellow hearts of grass stems have a delicious flavor when baked.

But three days ago there came a change. Sherman and Kraicki were out hunting together. I was in our home, trying out some darts I had made with fragments of wood and glass points, when Sherman burst in, panting with speed and very pale.

"What's the matter?" I asked, "and where's Kraicki?"

"Gone," he said. "Grimshaw's got a cat. It found us."

Then I saw it all.

So I am leaving this record. There is no more hope for us. All that remains is a chance, however remote, that these capsules will fall into the hands of some not too skeptical individual who will take the trouble to investigate—the shadowy chance of a delayed revenge which I shall not live to see. I only hope the cat will not get me before I can secrete these capsules in some place where they will be found. Winter is coming; we dare not hunt for fear of the animal, and our food is running short.

THE END

A DREAM

By Edward Reid

O' conquered is space,
And eons away
Lies the gauzy lace
Of the Milky Way.

A starry Circe
To hypnotize,
A new-born curse
In a woman's eyes.

And Man goes forth
With tight-lipped mouth,
Where is no North
And never a South.

But straight and fleet
To the Southern Cross,
A glad retreat
From Earthly dross.

For conquered is space,
And eons away
Lies the gauzy lace
Of the Milky Way.

The White Dwarf

By J. LEWIS BURTT

We recommend this story to readers of Jeans' and Eddington's fascinating works. For "The White Dwarf" is no fairy creation, but is a real thing, and the story concerns itself with the astronomical possibilities of future changes in our little cosmos. It gives a picture of astronomical possibilities, with a good bit of real human nature pervading its pages.

Illustrated by MOREY

THERE are few living today who can remember the beginning of the "Great Migration," fewer still who can remember what our world was like in the old days, for the very old are apt to confuse the memories of their early childhood with those of later years.

Our histories tell the story, our children are taught these things in schools so that they can relate all the strange and marvelous facts, but what does it all mean to them? Very little I fear.

They recite the name of Robert Sanderson mechanically. They tell you of his greatness, but it seems to me that they look on him as a mythological character rather than as the very human, kindly man he really was.

Perhaps I am approaching my dotage —I am nearing the century mark—and perhaps I just imagine this to be so, but whether I am right or wrong about it, I feel that, before I pass, I must set down the story of the great preserver of our race.

Of all men, I am best fitted for this task, for my memories of him and of his work are stamped indelibly on my consciousness by the great love I had, and still have, for him.

As a great historical figure he lives in the *minds* of all. My desire is that, through my humble efforts, he shall henceforth live in the hearts of all as benefactor, friend and true gentleman.

I have before me my own records, the earliest written in a very childish hand, and his own. These latter constitute my most valued possession and when, after my passing, it becomes the property of the nation, it will be perhaps the world's most treasured document. The facts I can check from these records; the spirit of my beloved father, Robert Sanderson, I *may* succeed in passing on in some measure from the record written in my heart.

Perhaps we old ones are prejudiced, but to us that world of the old days was more desirable and beautiful than this of to-day. You youngsters think this a wonderful world, and so it is in many ways, but then you have no memory of——

"Well, picture it if you can. In place of our little white sun put back the sun as we knew him in the days of his glory,

Three days later into our atmosphere came a long, shining projectile, shooting flame and fire from its nose.

a brilliant, golden ball of fire five times as big across, five times as big, even though he was so far away. Picture to yourselves the wondrous coloring of the world bathed in this golden-white light. Picture its beauty under the multi-colored rays of dawn and sunset, colors never seen on earth to-day.

Picture too the eerie, magic beauty of the world, when faintly lit by the light reflected from that lost satellite, the moon, itself a fairy-like, silvery disk of charm and loveliness. You cannot? No, and we ourselves never valued that beauty at its full worth until it was taken away from us forever.

We were so sure that nothing would change. Did not the astrologers tell us that the sun would continue almost without change for countless millions of years? Were we not in a region of space altogether free of any nebulosity which might produce undesirable conditions? So we went on living in our fool's paradise, unheeding, unwarned.

"Unwarned" did I say? That is not quite true. As far back as 1928, a full thirty years before the beginning of the change, we had the warning, if we had only realized it. That wise old astronomer, Doctor Jeans, had told us of the danger, yet I doubt if even he took his own words seriously. Here is the very extract from his book:*

*It is slightly disconcerting to find that our sun's position in the temperature-luminosity diagram suggests that it is pressing with perilous force against the dangerous edge of the main sequence, so that its collapse into a feebly-luminous white dwarf may commence at any moment. (Jeans. "Astronomy & Cosmogony".)

Little did he suspect that that change must already have commenced in the interior of the sun!

THE first note of alarm was sounded by one of the astronomers at Mount Wilson observatory. For what season he was re-examining the solar spectrum we don't know, but something or other caused him to compare his new photographs with similar ones taken many years before.

It is perhaps due to the keenness of this unknown observer's eyesight that we to-day have our continued existence, for it was his detection of microscopic differences between the old and the new spectra, that first told us the truth.

There was no doubt about it. The sun was changing its spectral type and, as cosmic changes go, was changing with incredible rapidity.

Of course, the news-sheets and the radiocasts got hold of the story and, of course, they garbled and twisted it as usual. The first news the world heard about it was a six-inch scare headline in San Francisco's leading daily of July 10th, 1961. In huge, red letters the paper screamed,

END OF THE WORLD
THE SUN BLOWING UP

Fortunately, in this case, no one took the paper seriously. We were all used to that sort of thing. Oh yes, people bought the paper, but most of them to see what new hoax it was, or to find out what new product was setting out on an advertising campaign.

Instead of panicking, the western world treated it as a huge joke. But not for long. The men at the telescopes soon made it clear that this time there was no hoax. In very truth the sun was changing, but, they assured us, there was nothing to worry about yet. These changes are matters of milleniums—plenty of time for this generation to live out its life and for its successors to become adapted to the differences, if any, that our earth would experience.

It was not until 1963 that observations were sufficiently numerous to tell the whole story of the change. During the period prior to this, astronomers had put forward many theories. Some said that

the sun was about to expand into a "nova" as the result of its own internal pressure, and prophesied a fiery death for our world. Others said that internal forces had at last become synchronized and were causing a pulsation that would cause the sun to split into a binary system, and assured us that the effect of this upon the earth would not be serious. A third school insisted that, though this might eventually happen, the only immediate change was that possibly the sun would gradually develop into a variable star, though not at all probably of the Cepheid type.

Strangely enough no one suspected the real truth until 1963, when my father, who was even then a brilliant spectroscopist, dropped the proverbial bombshell. The sun was *commencing to shrink into a White-Dwarf star.*

There was no doubt of it. The rival astronomers, all eager for new light on the phenomena, re-examined their data and calculations, and one and all confirmed my father's prophecy.

Still the world felt no anxiety. After all, it would be such a slow change that only the astronomers would notice it within a life time. It was again a case of "aprés nous le déluge."

"I was only a small boy at the time—ten years old to be exact—but I can still remember him throwing down his newspaper in disgust, still see him turn to his physicist friend, Jack Tremayne, still hear his words:

"What fools; this isn't a matter of generations at all! The sun's unstable I tell you. The collapse has actually commenced and will continue with increasing rapidity."

"Is it really as serious as that?" his friend asked him, "You're not usually a scaremonger, Bob, but even coming from you this is hard to believe."

"Listen, Jack," my father told him earnestly, "the position as I see it is this. Our world is doomed to slow death from freezing. Now, shall I broadcast the facts, tell the people the ghastly truth, or let them die slowly and miserably, hoping on to the end that somehow they will yet be saved?"

AT this Tremayne leaned forward in his chair and stared intently at my father.

"You don't *mean* that, do you Bob?" he asked. "Is it really as bad as that?"

"I'm afraid it is. According to my figures the point of instability was reached fifty years or so ago, and, sometime between that time and this, the sun's interior began to contract. Now the surface layers are beginning to feel the effects of this internal strain and already visible fluctuations are occurring.

"Within about sixty years our sun will have become a star very much like the little companion of Sirius, a feeble, white dwarfs. True—its central temperature will still be enormous. In fact it will rise to millions of degrees, but the heat will not be able to radiate on account of the terrific internal resistance. The atoms will be packed so closely and be so far stripped of their electrons that they will not be able to radiate freely. (You know what I mean, even if I'm not using the physicists' language.)

According to my figures, instead of having an average density of 1/5th that of water as at present, the sun will contract until its density is about sixty-thousand that of water—say a ton or so to the cubic inch—which will give it a diameter of considerably less than thirty-thousand miles instead of its present nine-hundred thousand miles.

"This means a radiating surface of about one thousandth the present area and, even though the surface will be much hotter, yet the total radiation will not be much more than a third of one percent of its present value. In other

words, our sun will shrink to the level of a star of the twelfth magnitude, or thereabouts.

"There's no need to elaborate on the effects of *that*, is there?"

"I guess it's the end all right, Bob, if that's really the case," Tremayne was forced to admit, yet, even in the face of these definite figures, he couldn't quite believe that the end of the world had really come.

"Is there no way out?" he asked presently.

Father shook his head sadly.

"No, I'm afraid there isn't, Jack. Not unless——"

"Unless what?"

"Oh, nothing. I just thought for a moment that we might—but it's utterly impossible."

Tremayne looked hard at my father.

"What's that, Bob? Did I hear *you* use the word 'impossible'?"

"Yes, I know," father answered, "I know I've always bawled you out for using it, whenever I got a chance. I know I've always said that impossibilities don't exist, and yet now I'm forced to eat my own words."

Tremayne got up from his chair and stood in front of his friend.

"Bob," he said quietly, "I'm not listening to that from you. You don't believe it's the end anymore than I do. The very fact that you thought of a possibility proves that, doesn't it?"

"I thought of that too," father replied, "but I know it's useless to kid ourselves —call it the optimism of youth if you like, and then remember that our sun is dying of old age."

"All right then, Bob, I *will* call it the optimism of youth. Now *you* listen. Put it this way. Our sun isn't dying, but merely changing from one state to another. The old state has become untenable, therefore it must change to the new one. But why call it 'death'? Why not call it a re-birth, and say the sun is renewing its youth?"

"VERY pretty, Jack." My father was still unconvinced. "But I'm afraid it's not very practical. The sun *may* go on living for many more millions of years, but such a sun cannot give much light and heat to the poor old earth. No, Jack, it's the end for us, whichever way you look at it."

"Snap out of it, Bob." Tremayne still persisted in his efforts. "I haven't finished yet. You can bombard me with all the pessimistic facts you can find, but I still won't give up hope. As you say, it may be the optimism of youth—we're neither of us much over thirty yet—but youth's optimism has generally got us further than age's pessimism.

"Come on now, let's hear this idea, how ever impossible it sounds."

"All right, Jack, if you *must* have it. What I started to say was this:

"'There isn't any way, unless we can move the earth closer to the sun.'—Now chew on that for a while and see if you'll talk any more about going on hoping."

"I don't need to chew on it at all. Why should it be so impossible to do that?"

"You, a physicist, ask that?" father laughed. "Pray tell me, good sir, against what shall we push in order to drive the earth out of its present orbit?"

Tremayne shrugged his shoulders.

"I don't know," he admitted. "I'll agree that it *looks* crazy, but in any case a little experimental figuring won't hurt anyone, and it'll be an interesting little problem to tackle at the least."

"All right then," father was naturally optimistic, and Jack Tremayne's arguments had served to chase away the cloud of hopelessness. "It's a go. Come and have dinner here to-day week and we'll compare notes and see which of us is right."

I shall always remember that dinner.

Perhaps it was the undercurrent of excitement that prevailed, or perhaps it was that in the discussion which followed the meal, I was forgotten, and so was allowed to sit up till long after my usual bedtime. Whatever the reason, I have always retained a clear picture of that night.

During dinner, neither Uncle Jack, as I used to call him, nor my father spoke of the big problem, but as soon as they had settled down before the fire, father went right to the point.

"Well, Jack, what about it?" he asked.

"No luck, I'm afraid, Bob." Uncle Jack hated to make the admission I'm sure, "It's going to take almost unlimited power to move this old earth. You were right last week when you reminded me that we've nothing to push against."

Then father, who had been struggling hard to hide his elation, fired his first broadside.

"So the optimist and the pessimist have changed places, have they?"

"Changed places? How come?" asked Uncle Jack, knowing that something unexpected was coming.

"Sure. I'm the optimist this time. Ever heard of a rocket?"

"And I thought you had an idea!" scoffed Uncle Jack as he sat back with a mock sigh. "Sure I've heard of rockets. Didn't we nearly blow ourselves up with 'em when we were kids? But as for shifting the world with 'em—nothing doing. Why they can't even make a decent rocket motor to drive an aeroplane!

"At that I spent a couple of days figuring on the darned things—just in case."

"Well?" father queried mischievously, "And the answer to that calculation was?"

"The same as you got, I reckon. Not enough power available on the earth to get even a thousandth part of the reaction needed."

"Sure, Jack. That's what I got too—*at first.*"

"What d'you mean 'at first?'" Tremayne almost shouted it. He knew how that there *was* something coming.

"JUST what I say. It looked just foolish at first, but I either had to solve the problem or spend the rest of my life listening to your feeble jibes and alleged wit," he grinned, "so I got busy and did some more figuring on new sources of power."

"And you found one?"

"Found one? No, *you* found it!"

"*I* found it? What the devil are you talking about?"

Uncle Jack really was surprised this time.

"The great physicist fails to apply his own discoveries to the solution of practical problems," jeered father as Tremayne became more mystified than ever.

"Your——" he began to explain, but Uncle Jack stopped him with,

"My 'atom-buster.' Well, of all the dumbells!"

"'Atom-buster.' That's good!" laughed father. "I quite thought you'd figure that in somewhere, being the discoverer of it and all that, but just in case *you* didn't, I did. Listen!

"Your machine develops power by converting mass into radiation, and from what I've seen of it, it appears to have a fairly high efficiency. Then why not use it to develop beams whose radiation-pressure will be directed outward from the earth. Won't the reaction of such beams give a rocket effect and force the earth in the opposite direction?"

"Hm-m-m. I suppose so, but even so, it doesn't seem possible to produce such terrific beams as we should need—they'll be extremely inefficient too."

"At a guess I'd be inclined to say that we'd have to disintegrate so much matter that that in itself would wreck the earth.

Then, too, think of the atmospheric disturbances. They alone would be sufficient to kill us all off.

"It's too bad Bob, but I guess it's not practical."

"It isn't, eh?" father got up, went across to his desk and took out a file of papers. "Well, just look those over will you, you old sceptic?"

Tremayne took the papers and for nearly half an hour he studied them in silence, after which the discussion started again.

"Look here, Bob," he opened up, "These figures are all very well, but why wreck the earth to save it?"

"Not going to wreck anything. Why should I?" father challenged.

"You won't, eh? Well, look."

I rather suspect that Tremayne was already convinced, but he and father often used to adopt this antithetical manner just to bring out the weak points in an argument.

"According to these figures you plan to use the annihilation of matter, produced by my short-wave ray machine, to produce a beam of radiation, whose reaction will speed the earth in its orbit and at the same time drive it towards the sun until it is finally forced into a new orbit a little less than five-million miles from it. That right?"

"Yes, that's about it, Jack, and why not?"

"According to your own figures you will require about 10^{16} (10,000,000,000,000,000) horse power. What about atmospheric disturbances when you start up a beam like that? Why, ionization alone——"

"Yes, I know, Jack. It's going to mean terrific storms and unprecedented electrical disturbances, but that's inevitable. We can minimize this by getting to as high an altitude as possible to start our beams—we'll have to, anyway, because we don't want to have any more atmosphere in the path of our beam than we are forced to."

"What do you mean, '*our* beams'? You're talking as though it was all arranged."

"I know I am, Jack. It's going to be. There's no other possible way, so you and I are going to get this thing started—force it on the world if we have to."

"BOB, you're crazy!" Uncle Jack's expression of delighted admiration entirely belied his words. "Suppose we grant you that bit about the atmosphere, what's going to happen when you start shoving on the earth with such a pressure? You'll split it in two!"

"No we shan't. We'll place our beams on mountain tops of high plateaux, where the crust is strong enough to stand the push. Then, too, we don't pull all the power in *one* beam—couldn't handle it anyway—but use several hundred to distribute the strain."

"Well, sounds possible," Uncle Jack admitted, "but there's still the great objection that when you bring a planet very close to its primary sun the tidal strains will tend to smash it into fragments like the rings of Saturn."

"Sure, *if* we get close enough," father agreed, but if you'd only learn a bit of astronomical mechanics you'd know that a planet is safe if it's three or four times the sun's radius away, unless there is a great difference in their relative densities.* In our case we shall be several hundred diameters distant, since the sun will have shrunk to about 26,000 miles across, so we'll be quite safe even when we consider the great density of the contracted sun."

"But how about the daily rotation,

*For two bodies of similar density, the small body will be broken up as soon as the radius of its orbit becomes less than 2.45 times the radius of the large body. If the smaller body is less dense than the larger, the distance is increased correspondingly. This figure is known as Roche's limit.

tides, seasonal variations and things of that sort, Bob?"

"They'll be darned funny to get used to at first, for some of them are going to be altogether different, but we'll have fifty years or so to get used to them. It'll take that long for the sun to contract, and our speed of approach must be calculated to conform to that, otherwise we'll either fry or freeze at some point on the way. It'll be considerably disconcerting at that, for we can't possibly adjust the changes in our orbit to allow for the fluctuations that the sun will necessarily undergo. Still I don't think it'll be too bad if we keep approaching at about the speed required to keep the earth's average temperature somewhere about where it is now.

"Of course conditions will be vastly different, but man is an adaptable creature. Let's see how it sounds:

"We can keep the daily rotation constant by directing our rays accordingly. We get rid of seasonal changes altogether by forcing the earth's axis more normal to the plane of the ecliptic. The short year of about four and a half days won't bother us in the least, for we shall not notice it except by observing the stellar movements. The increased velocity of the earth will be as undetectable as is our present speed; we shan't feel a steady speed of eighty-three miles a second any more than we can feel the nineteen-miles a second we are now doing.

"No doubt there will be considerable discomfort and disturbance, even probably some actual suffering, during the periods of acceleration, but that's unavoidable and it is certainly less unpleasant than slowly freezing to death.

"The high tides'll be a bit of a nuisance, I must admit, and they'll spoil a lot of good country, but they'll still be endurable say four-to six-hundred feet on most coasts." He paused for a moment, then continued seriously, "It's going to be a tough journey right enough, I can see that, but 'needs must when the devil drives' you know, Jack."

"I suppose so. Check over those figures again. Thanks. Now let's see. You figure a group of rays developing about 10^{16} horsepower will give you sufficient push to give an acceleration of half a centimeter per second per second—hm-m-m. That shouldn't jar things too badly, but it'll get us up to eighty-three miles a second in a lot less than fifty years, won't it?"

"SURE it will, but you don't suppose we can use continuous raying, do you? I figure that if we use them for about ten minutes at a stretch we'll cause enough fun. Don't forget we'll have the atmosphere, as well as the oceans, trying to lag behind. That means terrific wind storms and bad tides. A ten minute push means an interval of some hours to let the atmosphere re-adjust itself.

"Two banks of rays, one on each side of the earth, operating alternately, should give the minimum of trouble, and ten minutes every twelve hours will give us plenty of time."

Tremayne studied the figures a bit longer. Then he shot some more questions.

"See here, Bob, you've figured that the total acceleration required (sixty-four miles a second, or, say, ten million centimetres a second) will be given by an amount of energy equal to the total destruction of thirty-million tons of matter. Then why on earth do you go on calculating on a basis of a thousand times that?"

"Why not? Do you expect our rays to be a hundred per cent efficient? If we get a tenth of one per cent efficiency out of them we'll be darned lucky, shan't we?"

"Yes, that's true, but now here's another trouble. If we accelerate, the earth

won't fall towards the sun. It'll tend to fly off at a tangent to its present orbit and it will eventually land up away *further* from the sun instead of nearer.

"It would if we merely shoved it along faster, but if we shoot the rays outward, we can so direct them as to drive the earth towards the sun as well as speeding it up—just a matter of careful calculation that."*

"How about the moon, Bob?" was the next question.

"Don't need it do we? We'll sort of miss her old face for a while, I guess, but we can't afford to take her along with us. Besides we can take the first pushes against her. Until she gets driven too far away, say a couple of million miles, we'll save all kinds of power by pushing against her"

And so the discussion went on all evening and far on into the night until, at last, Uncle Jack was fully satisfied.

As he rose to go he said,

"It's a wonderful scheme, Bob, and I'm right with you. How soon do we start?"

"If we're lucky we'll get the people convinced within a year, or a couple of years, maybe. They'll very soon be noticing a change in conditions, that will do more than all our arguments.

"Then say ten years for preparation and another fifty years for the long ride.

"Say, Jack, we'll be old men before we get there. Maybe we'll not see the end of the trip at all."

"Likely not, Bob," Uncle Jack agreed, "but even if we don't, young Ted here," putting a hand on my shoulder as I got up rather sleepily, "will be able to finish the job for us."

"Good-night, old man! See you up at the observatory sometime to-morrow."

A MONTH or so later, after consultation and discussion with the leading scientists and statesmen of the world, my father issued a statement through all the main news agencies:

"Various contradictory rumors as to the important changes now occurring in the structure of the sun have been circulated during the past two years. These rumors have been vague and often ill-expressed by uninformed persons, and have led to the whole matter being treated as a joke.

It is therefore necessary to inform the peoples of the earth of the true state of affairs.

Let us assure you, first of all, that there is no cause for panic, although it essential that world prepare for a time of intense disturbance calling for great courage and self-sacrifice on the part of everyone.

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*The non-scientifically minded will no doubt prefer the story without too much mathematics, but for those who are interested in that side of things we append the following outline of the figures that my father first showed to Uncle Jack:

The sun's present state is that of a 'G' type star of 880,000 miles diameter and surface temperature about 6,000° C. Its absolute magnitude is about 4.85 and its mass about 2×10^{27} tons. A star of this mass and size is just on the border-line of the "main sequence" and, in the case of our sun, has recently become unstable and has started to collapse to the next stable configuration, that of a "white dwarf."

The shrinkage will take about sixty years more, the final state of the sun being that of the star known as Sirius 8. It will have a diameter of only 26,000 miles, with a surface temperature approaching 8,000° C, and a central temperature almost beyond estimation (say a billion degrees). Its density will be increased to about 40,000 times its present value, on the average say about a ton to the cubic inch.

Its total radiation will decrease in the ratio of about 1 to 400, making it a star of about the 12th magnitude. The visible light radiation will be a little greater than this, the heat radiation being correspondingly less.

In order that the earth may receive the same amount of heat from the sun as it now does, we must move to an orbit of less than five million miles radius. This can only be done by increasing the orbital speed from its present 19 miles a second to about 83 miles a second, which will give an orbital period of about 4.4 days, so that the term "year" will become almost meaningless.

To accelerate the earth's mass (3×10^{21} tons) to this speed requires at least 6×10^{31} ergs of energy, and this is greater than the total energy available on the earth, unless we release vast stores of energy by the annihilation of part of the earth's substance.

The annihilation of one gram of matter releases 9×10^{20} ergs, which gives us a figure somewhere around 6×10^{10} grams to be annihilated—say about 30 million tons.

Estimating the reaction from the energy release—the radiation pressure—at one tenth of one percent of the energy release, we require 3×10^{10} tons or say from ¼ to ½ a cubic mile.

The reaction from this energy should give acceleration of (½ cm. sec.)^2 which will give the total speed required in about two million seconds. This divided over 50 years gives roughly 18 minutes per day.

Two stations on opposite sides of the earth, say the Andes and the Himalayas, radiating for ten minutes per day, should leave enough margin for all ordinary contingencies.

These stations must consist of matter annihilators, or "atom-busters," to use the popular term, capable of consuming and converting into energy a total of about 1500 tons a second.

We cannot stress too much the seriousness of the condition in which we find ourselves, and cannot urge too strongly our plea for immediate and united action by all peoples.

Briefly the situation is as follows:

Our sun is collapsing into the type of star known as a White Dwarf. The collapse will occupy about sixty years, at the end of which time it will give only about one-four-hundredth of its present light and heat.

This would mean total annihilation for the human race—a slow death by freezing—except that we have discovered a possible means of averting the tragedy.

We have refrained from publishing the facts until we could offer some hope of safety, because we did not wish to cause needless worry and suffering, but now that we have a solution to offer there is no further reason for hiding the truth.

Our only hope of salvation is to move the earth itself closer to the sun, and this can only be done at a tremendous cost and sacrifice.

During the next two weeks more details will be given you, and the probable effects of such an attempt explained. At the end of that time each government will conduct a plebiscite to determine the wishes of its people.

We strongly urge you, one and all, to vote "YES" to the Question, "Shall we make the attempt to move the world?" for it is our only hope of continued existence as a race.

This statement is issued with the approval of all governments and of all prominent scientific bodies.

ROBERT SANDERSON, D.Sc., F.R.S.
JOHN S. TREMAYNE, M.Sc., Ph.D.
On behalf of the Royal Society.

In spite of carefully written explanations and appeals, the plebiscite returned an overwhelming "NO" to the proposition. The world's attitude in general was:

"We've been hoaxed before. We don't intend to be fooled this time."

Still, in spite of this, the scientists continued their preparations, my father and Jack Tremayne being tacitly accepted as leaders in the enterprise, even by the older and more experienced men.

Six months later a second plebiscite was conducted. By this time the effects of the sun's instability had become a little more noticeable. It no longer shone with quite so steady a light. Variations in its radiations were becoming detectable, though faintly so, without the use of instruments, and as a result, weather conditions all over the world were showing great irregularities.

The world as a whole was not yet convinced, however, and this second vote confirmed the result of the former one—but with a greatly decreased majority.

Evidently some of the people were beginning to wonder.

The attitude of the various religious bodies was typical. The Buddhist churches folded their hands and talked of the "end of a cycle." The Mohammedan dismissed it in one sentence as "the will of Allah." The more conservative of the Christian churches at first denounced the advocates of the plan as blasphemous, but later on changed to an attitude of bitter scoffing. Only a few of the more progressive organizations saw in it a reasonable proposition, one or two even going so far as to point out that the discovery had been made in time to allow humanity to "work out its own salvation."

DUING the next six months it became obvious to all those who were reasonably observant that there certainly was something happening to the sun. They could no longer ignore the fluctuations now discernible in its brilliancy and also in its apparent size.

The result was that the third vote showed about fifty-two per cent against the attempt, and, by the end of the next period, human thought had swung around so far, that a three-fourths majority voted a definite "Yes."

Once the people's mandate had gone forth no time was wasted. Preparations must be commenced immediately, for the sun's shrinkage was proceeding even more rapidly than had been anticipated. If the attempt to save the world was to be made in time, it must be started within seven years at the least.

For once in history the world acted as a unit. Only one of the greater powers showed signs of giving trouble, and this one was speedily brought into line by pressure from within, as well as from the rest of the nations.

To us of the old days the task seemed overwhelmingly colossal. Even many of the leaders looked on it as a forlorn hope. In fact, one astronomer actually expressed the opinion that "at any rate it will be better to die quickly, rather than to live on to face slow starvation and freezing."

There was much discussion as to the exact places for setting up the "atom-busters" (Everyone, scientists and all, had now adopted Tremayne's humorous name for his disintegrators), but in the end they agreed on two areas in which the districts originally selected by my father, an area in the Andes not far from Lake Titicaca, and another in the north-east of Upper Burma to the east of the Himalayas. These two regions included a number of suitable plateaux well above the fifteen-thousand foot level, and they were almost exactly opposite to each other on the earth's surface.

At first points right on the equator were advocated by many, but they were finally rejected as giving the rays no thrust in a direction that would serve to swing the earth's axis perpendicular to the plane of the ecliptic.

The task of preparation was indeed colossal. A vast army of workmen was shipped to each of the chosen spots, or rather as near to them as was possible, for before anything else could be done, roads and railways had to be built to transport the mass of equipment needed.

During the three years that were occupied in this road construction the world's largest factories were put to work fashioning the necessary parts for the "atom-busters."

A great deal of experimentation had been necessary before a satisfactory machine was evolved. The first ones constructed were far too inefficient and small, but when they began to build bigger ones, they came up against troubles produced by the enormous forces and temperatures generated.

The first serious accident occurred in 1965. Father had designed a machine big enough to project a ten-foot beam of force. This machine used up fifty pounds or so of matter each second, and was intended as an experimental model for the big three-ton-a-second machines that were eventually to be constructed.

They all thought the trial would be a huge success, and, in their unwise enthusiasm, the factory authorities had arranged for a number of visitors to witness the tests.

About four o'clock one afternoon the big machine, already set up in an open space a hundred yards from the visitors' seats, was loaded with its first charges of crushed rock.

The mechanism consisted of a small projector of rays of extremely short wave length, rays short and penetrative enough to destroy the actual protons and electrons of matter.*

THIS activating ray started the disintegration of the matter in the main projector and the similar radiation produced from this in turn activated the rest of the charge in a cumulative manner,

*I am not physicist enough to explain exactly how Tremayne produced these rays, although I understand it to some extent. They were rays of shorter wave length than the "Millikan" or "cosmic" rays that caused so much excitement at one time, their wave length being of the order of 10^{-14} cm.

the intensity of the power developed being limited only by the speed at which the charge was fed into the focus of the machine.

The energy thus set free was focussed into a beam pointed in the required direction by means of extremely refractory reflecting surfaces. It was the production of these reflectors that had first made possible the original "atom-buster," no other known substance being able to withstand the terrific bombardment of the rays for a single instant.

In the machine under test these reflectors were six feet thick and were calculated to be opaque to the penetration of rays of the intensity to be produced.

Even these reflectors suffered considerable surface volatilization, so that two minutes was set at the time limit for projection.

The demonstration was to begin at 4.30 P. M. and at that time the factory superintendent, from his seat among the guests, threw on the activating beam.

There was a terrific crackling roar as the beam shot out into the sky. The beam itself was, of course, invisible, but its path was marked by an intensely dazzling beam of light, as the molecules of air in its path became ionized, or rather as the atoms themselves were stripped almost to their nuclei. Blazing particles of gas, the atoms torn off but not actually annihilated by the beam, streamed out into space in a fountain of living fire. The heat and electrical tension became unbearable. Terrific lightning flashes played around the beam and a wind began to blow towards the streaming fount of radiance.

The sight was utterly terrifying, but unutterably grand and impressive.

For forty seconds the superintendent stood motionless, except for the movements of his fingers on the feed controls. Then Uncle Jack, who was standing between him and me, shouted above the deafening din of the reverberating machine,

"Cut it out! *Cut it out, for God's sake!*"

The shout was drowned in the earsplitting noise. Desperately he tried to make the superintendent hear, but without avail. Then, realizing the futility of what he was doing, he grabbed the man's hands from the switches and, in an agony of apprehension, slammed everything into neutral.

But it was too late. The reflectors had already become too thin. Even as the ray died down from lack of fuel, the whole machine exploded with terrific violence, scattering blazing pieces of itself in all directions.

Had the machine burst while radiating at full blast the result would have been something indescribable, perhaps even the uncontrolled disintegration of the earth itself, although the general opinion was that such a catastrophe is impossible.

Even as it was, the shock was felt for miles. Of the group of spectators, six were killed outright, while all were more or less severely injured by the concussion and the flying fragments. The superintendent was among the killed, but, strangely enough, Uncle Jack and I both escaped with very minor injuries and burns.

I suppose a few such accidents were humanly unavoidable, but I know that this one impressed me so deeply that for weeks I begged my father to give up his plan and let the world die out in peace after all.

It may have been the shock that affected me in this way, I think likely, for I snapped out of this phase as suddenly as I was jarred into it, and once more I became as enthusiastic a helper as anyone.

Perhaps this little tragedy was not altogether to be regretted, for out of it eventually came much good. For months

after it, both father and Uncle Jack worked continuously on the production of a still more refractory substance for the reflectors, I too working with them and learning all I could, so that I could continue the work when their time came to lay it down.

WE did succeed at last, our success being without any doubt due to the magnificent courage, confidence and faith of these two wonderful men. Never once during this period, nor at any other time for that matter, did either of them lose faith in their ultimate success, never did they let down on their activity unless such a let-down could be indulged in without delaying the work. Being human, they sometimes became irritable, but notwithstanding this, they usually kept a calm and kindly manner that endeared them to every one who worked with them.

We call these men great because of what they accomplished in devising and working out the plan, but I tell you that their real greatness lay not in that, but in their fine character, in their unshaken confidence that inspired a world, in the greatness of their love for humanity that enabled them to save a world not only from destruction by that terrible freezing death, but from the horrors of fear and panic, from the effects of those waves of terror that seemed at times to sweep the whole world.

Very human were these two men. I have seen my father stop an experiment to tend to a workman who had burned a hand. There were others to do it, but the burn had been caused by an unavoidable slip on my father's part, and so he felt it was up to him to make personal amends to the unfortunate victim.

By the middle of 1970 the banks of huge machines were almost ready to use. In each district a number of moderately flat areas totalling some hundreds of square miles had been found in the higher ranges, that in the Andes being well over the seventeen-thousand feet line, and the other less than a thousand feet lower. In each of these were set up four separate banks of "atom-busters," each consisting of some five-hundred huge projectors, each capable of annihilating over three tons of matter a second, and giving a sixty-foot beam of almost incalculable force.

These projectors could be adjusted to turn the beams through an angle of two degrees from the central point, which was exactly vertical. Further swinging would mean danger of forcing the whole apparatus over, while less gave insufficient movement for "aiming."

A discharge consisted of a ten-minute period of radiation from one bank of projectors, which would then be allowed to cool for three days, while others were used. After each discharge new reflectors had to be installed, and it was the construction and transportation of these uncounted millions of reflectors that had been the world's greatest difficulty.

September 15th, 1970, at ten o'clock at night, local sun-time, was the time set for the first discharge from the Andean station, the other station to follow with its discharge after approximately twelve hours. The time, 10 P. M., was decided on after a great deal of calculation, as giving the push which would give best results in both speeding the earth around the sun and driving it in towards the center. The course aimed at was, naturally, a gradually tightening spiral.

The first half-dozen discharges from the Andes were to be directed against the moon, as it was then in a suitable position and the reaction against it would, it was hoped, increase the push on the earth considerably. That was, of course, the chief reason for selecting that particular date for starting the raying, the moon being then very close to the full.

Remote control was installed to all the

machines, for anyone within a mile of any one of the big projectors would be pretty sure to come to a sudden and fiery end as soon as the ray was formed. The walls of protective screens, efficient as they were, were quite inadequate to check the whole of the unfocussed part of the radiation, and exposure to these short, hard waves meant instant death, even in comparatively low intensities.

As the momentous hour approached, father sat motionless and silent, his hand on the control switches.

Slowly the seconds ticked by. The company of watchers scarcely breathed, so intense was the strain.

JUST as the tension had become utterly unendurable, father moved the first switch. For a few seconds there was no sign of action. Then came a dull reverberating roar, as the first ten machines went into action.

One after another the switches went over. Moment by moment the reverberation increased, until at the end of a minute or so, the whole earth seemed one chaos of infinite sound and infinite vibration. Away into the skies stretched beam on beam of fearful radiance, beams of marvelous beauty, haloed with lightnings such as Old Father Jupiter himself never dreamed of.

Was there a sense of motion? Some of us fancied we could detect it, but none of us were sure.

Six observers, including Uncle Jack, sat with eyes glued to the telescopes, watching the changeless face of the full moon, a moon whose brilliance was completely overshadowed by the dazzling beams of power.

An interminable five minutes passed. The earth itself seemed almost riven apart, yet still that infinity of reverberating energy continued to flame forth.

One of the observers called suddenly, his voice coming shrill and clear through the awful din.

"We're moving I think, sir!"

Instantly father leaped to the lad's telescope, checked its bearings, and the observer's figures. For another minute he sat there motionless, then with a very proud, yet extremely humble, movement, he rose and, seemingly without any effort, he called above the din,

"We *are* moving! Our world is on its way to safety!" and he added a very fervent "Thank God!"

A few moments later he reached out and commenced to throw over switches, the rays dying out as he did so. At first the silence seemed even more terrifying than the reverberation. Then the tense emotions burst their bounds and for a while we shouted and capered around like little children just out of school—all except father and Uncle Jack, who stood silent with clasped hands.

Our earth was at last started on its strange and wondrous adventure.

Calculation showed that the push of the ray was rather more than had been expected, but even so the period of radiation was not shortened. It was felt that it would be best to get ahead of schedule and then cease raying now and then for a period to let the world steady itself.

For a month the regular schedule was carried out, the effect of the alternate push from north and south of the Equator having exactly the desired effect of pushing the earth's axis over slowly to its new direction.

At the end of this month the atmosphere and the oceans were so disturbed that it was necessary to stop raying for some ten days, the storms having become so violent that serious damage was resulting.

This procedure—a month's activity followed by ten day's rest—was followed for nearly four years with hardly any

variation. By the end of that time we were running in an orbit almost identical with that of Venus.

About this time I was one night observing for father, when I thought I saw a flash of light from the dark side of that planet, which, being just then quite close to us, was a most magnificent sight far surpassing the glory of our old moon, now lost to us forever.

I called father, and together we watched. There was no mistake about it. Five separate and distinct flashes, each lasting about forty seconds, were observed.

"What do you make of it, dad?" I asked him.

"There can be only one explanation — signals," he replied without hesitation.

BUT he was wrong. It was more than signals. Three days later into our atmosphere came a long shining projectile shooting flame and fire from its nose. And within a few minutes came another—and another—until five of them were whistling through the air, checking their speed with their fire-tubes as they came.

Before they landed, they cruised over a great part of the earth' surface, coming to rest finally close to the great Yerkes observatory.

Since it was by no means certain whether these Venerians were friendly or not, they were met by the entire staff of the observatory, all armed, but these precautions proved entirely superfluous, since the visitors were here on a peaceful mission.

To-day we were familiar with the appearance of the Venerians, but these first arrivals seemed very strange and bizarre, with their many limbs and their curious, translucent bodies.

They stayed with us for nearly three months before we could converse with them sufficiently fluently to give them the information they had come for. It seems that they, too, had suspected something wrong with the sun, but they could not make out what the trouble was, since their cloud-girt world made observation difficult. By a lucky chance they had seen our world approaching their own, and had been able to guess, by noticing its irregular orbit, that it was being driven from its old path by intelligent beings. They had, therefore, made a great effort and had so much improved their reaction-motors that they were able to send five space ships across space to us, to inquire what it was all about.

It has always seemed curious to me that the Venerians, who in many ways are so far behind us, should, as the result of our efforts in moving our own world, perfect the very thing that we ourselves had failed to develop satisfactorily—the rocket-ship.

As soon as the Venerians fully understood the state of affairs they returned to their own world, saying as they left:

"Now that we know that you of earth are no more hostile to us than we are to you, perhaps we shall be able to develop an intercourse profitable to us both.

"At the present moment we both have greater problems to attend to, so that must wait, but not for very long, we feel.

"We can never be grateful enough to you for giving us the secret of your projection machines. Before long we shall be following you, for we, too, must perish otherwise."

The rest of the journey was without interest. We never seemed to get accustomed to the reverberation of the "atom-busters" nor to the violent storms that swept the earth almost continuously. We hated them but we tolerated them, because we could not do otherwise, consoling ourselves with the thought that some day they would no longer be necessary.

There was no dramatic climax to our journey. We just rode into our new orbit and then ceased to ray any more. No doubt it would have made better reading if I could have described a magnificent climax, but certainly no one on the earth desired any such finish. We were all so heartily sick of the continuous racket, that all we wanted was the chance to settle down peacefully once more.

The gradual development of the huge tides, with the consequent inundation of large areas of fertile land, and of most of the great cities, came about so gradually that we had plenty of time to get used to them and to change our intra-continental traffic from ocean-going to air-going. The increased volcanic action troubled us but little, since most of the action was directed through the old volcanoes, most of which were far from the populated districts.

The gradual change in the condition and types of plant growth was extremely interesting and, on the whole, beneficial. The increasing preponderance of the shorter waves in the sun's light produced not only greater fertility but more beautiful forms.

THE only noticeable effect on our bodies was, as you are all aware, to darken our skins so that to-day we are all permanently "sun-tanned," as we should have called it in the old days. Our eyes, too, have changed a little, due to the difference in the quality and intensity of the daylight.

Our seasonless year of four and a half days still seems strange to us who knew the old, fascinating, seasonal changes, though to you children of the new generation it is normal enough, especially since we still keep the old period of three hundred and sixty-five days as our legal year.

For a while, too, we missed the moonlight, but now that Venus has come here too, we have a light that even I must admit is better than the old one.

The old Venerian who first thought of bringing the two planets together into a binary system was a real benefactor to both worlds.

My father and his friend lived to see the successful completion of their task. In fact, it seems almost as though they just lived on for that, for both of them passed within a few months of the stabilization of our new orbit.

And now I too am an old, old man, ready to pass into the great beyond. I have been blessed above all men, for to me has been given the privilege of living through the whole of this wonderful era, and of being closer than any other to that man of all men, my beloved father, Doctor Robert Sanderson.

My life's work is ended. The story is told as I would have you know it. My dear wife has already preceded me, and now I am ready to go myself, confident in the knowledge that man will go forward and rise to undreamed-of heights in this new-old world that, despite all the troubles and difficulties, has been to me a very good world to live in.

THE END

Measuring a Meridian

Serial in III Parts—Part I

By JULES VERNE

CHAPTER I

On the Banks of the Orange River

ON the 27th of January, 1854, two men lay stretched at the foot of an immense weeping willow, chatting, and at the same time watching most attentively the waters of the Orange River. This river, the Groote of the Dutch, and the Gariep of the Hottentots, may well vie with the other three great arteries of Africa—the Nile, the Niger, and the Zambesi. Like those, it has its periodical risings, its rapids and cataracts. Travelers whose names are known over part of its course, Thompson, Alexander, and Burchell, have each in their turn praised the clearness of its waters, and the beauty of its shores.

At this point the river, as it approached the Duke of York Mountains, offered a magnificent spectacle to the view. Insurmountable rocks, imposing masses of stone, and trunks of trees that had become mineralized by the action of the weather, deep caverns, impenetrable forests, not yet disturbed by the settler's ax, all these, shut in by background formed by the mountains of the Gariep, made up a scene matchless in its magnificence. There, too, the waters of the river, on account of the extreme narrowness of their bed, and the sudden falling away of the soil, rushed down from a height of 400 feet. Above the fall there were only surging sheets of water, broken here and there by points of rock wreathed with green boughs; below, there was only a dark whirlpool of tumultuous waters, crowned with a thick cloud of damp vapor, and striped with all the colors of the rainbow. From this gulf there arose a deafening roar, increased and varied by the echoes of the valley. Of these two men, who had evidently been brought into this part of South Africa by the chances of an exploration, one lent only a vague attention to the beauties of nature that were opened to his view. This indifferent traveler was a hunting bushman, a fine type of that brave, bright-eyed, rapidly-gesticulating race of men, who lead a wandering life in the woods. Bushman, a word derived from the Dutch "Bochjesman," is literally "a man of the bushes," and is applied to the wandering tribes that scour the country to the northwest of Cape Colony. Not a family of these bushmen is sedentary; they pass their lives in roaming over the region lying between the Orange River and the mountains of the East, in pillaging farms, and in destroying the crops of the overbearing colonists, by whom they have been driven back towards the interior of the country where more rocks than plants abound.

This bushman, a man of about forty years of age, was very tall, and evidently possessed great muscular strength, for

At last the vessel was in sight, and William Emery and his companion were seen by those on board.

even when at rest his body presented the attitude of action. The clearness, ease, and freedom of his movements stamped him as an energetic character, a man cast in the same mold as the celebrated "Leather-stocking," the hero of the Canadian prairies, though perhaps possessing less calmness than Cooper's favorite hunter, as could be seen by the transient deeping of color in his face whenever he was animated by any unusual emotion.

The bushman was no longer a savage like the rest of his race, the ancient Laquas; for born of an English father and a Hottentot mother, the half-breed, through his association with strangers, had gained more than he had lost, and spoke the paternal tongue fluently. His costume, half-Hottentot, half-European, consisted of a red flannel shirt, a loose coat and breeches of antelope hide, and leggings made of the skin of a wild cat; from his neck hung a little bag containing a knife, a pipe, and some tobacco; he wore on his head a kind of skull-cap of sheep-skin; a belt, made from the thick thong of some wild animal; encircled his waist; and on his naked wrists were rings of ivory, wrought with remarkable skill. From his shoulders flowed a "kross," a kind of hanging mantle, cut out of a tiger's skin, and falling as low as the knees. A dog of native breed was sleeping near him, while he himself was smoking a bone pipe in quick puffs, giving unequivocal signs of impatience.

"Come, let's be calm, Mokoum," said his interlocutor. "You are truly the most impatient of mortals whenever you are not hunting; but do understand, my worthy companion, that we can't change what is. Those whom we are expecting will come sooner or later—to-morrow, if not to-day."

The bushman's companion was a young man, from twenty-five to twenty-six years of age, and quite a contrast to him. His calm temperament was shown in every action, and it could be decided without a moment's hesitation that he was an Englishman. His much too homely costume proved him to be unaccustomed to traveling. He gave one the idea of a clerk who had wandered into a savage country; and one looked involuntarily to see if he carried a pen behind his ear, like a cashier, clerk, accountant, or some other variety of the great family of the bureaucracy.

In truth, this young man was not a traveler, but a distinguished *savant*, William Emery, an astronomer attached to the Observatory at the Cape—a useful establishment, which has for a long time rendered true service to science.

The scholar, rather out of his element, perhaps, in this uninhabited region, of South Africa, several hundred miles from Cape Town, could hardly manage to curb the impatience of his companion.

"Mr. Emery," replied the hunter in good English, "here we have been for eight days at the place appointed on the Orange, the cataract of Morgheda. It is indeed a long time since it has befallen a member of my family to remain eight days in one place; you forget that we are rovers, and that our feet burn at lingering."

"My friend Mokoum," replied the astronomer, "those we are waiting for are coming from England, and surely we can allow them eight days of grace: we must take into account the length of the passage, and the hindrances which a steam vessel must meet with in ascending the Orange; and, in short, the thousand difficulties belonging to such an undertaking. We have been told to make every preparation for a journey of exploration in South Africa, and that being done, to come here to the Falls of

Morgheda and wait for my colleague, Colonel Everest, of the Cambridge Observatory. Well, here are the Falls of Morgheda, we are at the place appointed, and we are waiting: what more do you want, my worthy bushman?"

The hunter doubtless did want more, for his fingers played feverishly with the lock of his rifle, an excellent Manton, a weapon of precision with conical shot, which could bring down a wild cat or an antelope at a distance of eight or nine hundred yards. Thus it may be seen that the bushman had put aside the quiver of arrows and the poisoned darts of his fellow country-men for the use of European weapons.

"But, are you not mistaken, Mr. Emery?" replied Mokoum. "It is really at the Falls of Morgheda, and toward the end of this month of January, that they have appointed to meet you?"

"Yes, my friend," quietly answered William Emery, "and here is the letter from Mr. Airy, the director of the Greenwich Observatory, which will show you that I am not mistaken."

The bushman took the letter that his companion gave him. He turned it over and over like a man not very familiar with the mysteries of penmanship; then giving it back to William Emery, he said, "Tell me again what the blotted piece of paper says."

The young astronomer, endowed with a patience proof against everything, began again, for the twentieth time, the story he had so often told to his friend the hunter. At the end of the foregoing year, William Emery had received a letter telling him of the approaching arrival of Colonel Everest, and an international scientific commission in Southern Africa. What the plans of the commission were, and why it came to the extremity of the continent of Africa, Emery could not say, Mr. Airy's letter being silent on that point; but following the instructions that he had received, he hastened to Lattakoo, one of the most northern stations in the Hottentot country, to prepare wagons, provisions, and, in short, everything that could be wanted for the victualing of a Bochjesman caravan. Then, as he knew the reputation of the native hunter, Mokoum, who had accompanied Anderson in his hunting expeditions in Western Africa and the intrepid David Livingstone on his first journey of exploration to Lake Ngami and the falls of the Zambesi, he offered him the command of this same caravan.

This done, it was arranged that the bushman, who knew the country perfectly, should lead William Emery along the banks of the Orange to the Morgheda Falls, the place appointed for the scientific commission to join them. This commission was to take its passage in the British frigate *Augusta*, to reach the mouth of the Orange on the western coast of Africa, as high as Cape Voltas, and to ascend the river as far as the cataracts. William Emery and Mokoum had therefore brought a wagon, which they had left at the bottom of the valley, to carry the strangers and their baggage to Lattakoo, unless they preferred getting there by the Orange and its affluents, after they had avoided the Falls of Morgheda by a land journey of some miles.

This story ended, and at length really impressed on the bushman's mind, he advanced to the edge of the gulf to whose bottom the foaming river threw itself with a crash: the astronomer followed, for there a projecting point commanded a view of the river, below the cararact, for a distance of several miles. For some minutes Mokoum and his companion gazed attentively at the part of the river where it resumed its tranquility about a quarter of a mile below them, but not an object, either boat or pirogue, disturbed its course. It was

then three o'clock. The month of January here corresponds to the July of northern countries, and the sun, almost vertical in lat. 29°, heated the atmosphere till the thermometer stood at 105° Fahrenheit in the shade. If it had not been for the westerly breeze, which moderated the heat a little, the temperature would have been unbearable for any but a bushman. Still, the young astronomer, with his cool temperament, all bone and all nerves, did not feel it too much: the thick foliage of the trees which overhung the abyss protected him from the direct attacks of the sun's rays. Not a bird enlivened the solitude during these hot hours of the day; not an animal left the cool shade of the bushes to trust itself along the glades; not a sound would have been heard in the deserted region, even if the cataract had not filled the whole air with its roar.

After gazing for ten minutes, Mokoum turned to William Emery, stamping impatiently with his large foot; his penetrating eyes had discovered nothing.

"Supposing your people don't come?" he asked the astronomer.

"They'll come, my brave hunter," answered William Emery: "they are men of their word, and punctual, like all astronomers. Besides, what fault do you find with them? The letter says they are to arrive at the end of January; this is the 27th, and these gentlemen have still a right to four more days before they need to reach the Morgheda Falls."

"And supposing they have not come at the end of those four days?" asked the bushman.

"Well! then, master hunter, there will be a chance for us to show our patience, for we wait for them until I have certain proof that they are not coming at all."

"By our god Ko!" cried the bushman in a sonorous voice, "you are a man who would wait until the Gariep had emptied all its roaring waters into that abyss!"

"No, hunter, no," replied Emery in his ever quiet tone; "but we must let reason govern our actions; and what does reason tell us? This—that if Colonel Everest and his companions, wearied with a tiresome journey, in want perhaps, and lost in this lonely country, were not to find us at the place of rendezvous, we should be to blame in every way. If anything went wrong, the responsibility would rest on us; we ought, therefore, to stay at our post as long as it is our duty to do so. And besides, we want for nothing here; our wagon is waiting for us at the bottom of the valley, and gives us shelter at night; we have plenty of provisions; nature here is magnificent and worthy of our admiration; and it is quite a pleasure to me to spend a few days in these splendid forests on the banks of this matchless river. As for you, Mokoum, what can you want more? Game, both furry and feathered, abounds in the forests, and your rifle keeps us supplied with venison. Hunt, my brave hunter! kill time by killing deer and buffaloes! Go, my good bushman; I'll watch for the loiterers meanwhile, and *your* feet, at any rate, will run no risk of taking root."

The hunter thought the astronomer's advice was good, and decided that he would go for a few hours and beat the neighboring bushes and brushwood. Lions, hyenas, and leopards would not disturb such a Nimrod as he, so well accustomed to the African forests. He whistled to his dog Top, an animal of the hyena breed from the desert of Kalahari, and a descendant of that race of which the Balabas formerly made pointers. The intelligent creature, as impatient, seemingly, as was his master, bounded up, and showed by his joyous

barking how much he was gratified at the bushman's intention. Soon both man and dog disappeared among the thick masses of wood which crowned the background of the cataract. William Emery, now alone, again stretched himself at the foot of the willow, and while he was waiting for the heat to send him to sleep, began to think over his actual position. Here he was, far away from any inhabited spot, on the banks of the Orange river, a river as yet but little explored. He was waiting for Europeans, fellow countrymen who had left their homes to run the risks of a distant expedition. But what was the expedition for? What scientific problem could it want to solve in the deserts of South Africa? What observation could it be trying to take in lat. 30°? That was just what Mr. Airy, the director of the Greenwich Observatory, did not tell in his letter. As for Emery himself they asked for his co-operation, as for that of a scientific man who was familiar with the climate of those southern latitudes, and as he was engaged in scientific labors, he was quite at the disposal of his colleagues in the United Kingdom.

As the young astronomer lay musing over all these thing, and asking himself a thousand questions which he could not answer, his eyelids became heavy, and at length he slept soundly. When he awoke, the sun was already hidden behind the western hills, whose picturesque outline stood out sharply against the bright horizon. Some gnawings of hunger told him that supper-time was near; it was, in fact, six o'clock, and just the hour for returning to the wagon at the bottom of the valley. At that very moment a report resounded from a grove of arborescent heather, from twelve to fifteen feet high, growing along the slope of the hills on the right. Almost immediately the bushman and Top made their appearance at the edge of the wood, the former dragging behind him the animal he had just shot. "Come, come, master purveyor!" cried Emery, "what have you got for supper?"

"A spring-bok, Mr. William," replied the hunter, throwing down an animal with horns curved like a lyre. It was a kind of antelope, more generally known by the name of "leaping buck," which is to be met with in every part of South Africa. It is a charming animal, with its cinnamon-colored back, and its shoulders covered with tufts of silky hair of a dazzling whiteness, whilst its under part is in shades of chestnut brown; its flesh, always excellent eating, was on this occasion to form the evening repast.

The hunter and the astronomer, lifting the beast by means of a pole placed across their shoulders, now left the head of the cataract, and in half an hour reached their encampment in a narrow gorge of the valley, where the wagon, guarded by two bochjesman drivers was waiting for them.

CHAPTER II

Official Introductions

FOR the next three days, the 28th, 29th, and 30th of January, Mokoum and William Emery never left the place of rendezvous. While the bushman, carried away by his hunting instincts, pursued the game and antelopes in the wooded district lying near the cataract, the young astronomer watched the river. The sight of this grand, wild nature enchanted him, and filled his soul with new emotions. Accustomed as he was to bend over his figures and catalogues day and night, hardly ever leaving the eye-piece of his telescope, watching the passage of stars across the meridian and the occultations, he delighted in the open-air life in the almost im-

penetrable woods which covered the slope of the hills, and on the lonely peaks that were sprinkled by the spray from the Morgheda as with a damp dust. It was joy to him to take in the poetry of these vast solitudes, and to refresh his mind, so wearied with his mathematical speculations; and so he beguiled the tediousness of his waiting, and became a new man, both in mind and body. Thus did the novelty of his situation explain his unvarying patience, which the bushman could not share in the least; so there were continually on the part of Mokoum the same recriminations, and on the part of Emery the same quiet answers, which, however, did not quiet the nervous hunter in the smallest degree.

And now the 31st of January had come, the last day fixed in Airy's letter. If the expected party did not then arrive, Emery would be in a very embarrassing position; the delay might be indefinitely prolonged. How long, then, ought he to wait?"

"Mr. William," said the hunter, "why shouldn't we go to meet these strangers? We cannot miss them; there is only one road, that by the river, and if they are coming up as your bit of paper says they are, we are sure to meet."

"That is a capital idea of yours, Mokoum," replied the astronomer: "we will go on and look out below the falls. We can get back to the encampment by the side valleys in the south. But tell me, my good bushman, you know nearly the whole course of the river, do you not?"

"Yes, sir," answered the hunter, "I have ascended it twice from Cape Voltas to its juncture with the Hart on the frontier of the Transvaal Republic."

"And it is navigable all the way, except at the Falls of Morgheda?"

"Just so, sir," replied the bushman. "But I should add that at the end of the dry season the Orange has not much water till within five or six miles of its mouth; there is there a bar, where the swell from the west breaks very violently."

"That doesn't matter," answered the astronomer, "because at the time that our friends want to land it will be all right. There is nothing to keep them back, so they will come."

The bushman said nothing, but shouldering his gun, and whistling to Top, he led the way down the narrow path which met the river again 400 feet lower.

It was then nine o'clock in the morning, and the two explorers (for such they might truly be called) followed the river by its left bank. Their way did not offer the smooth and easy surface of an embankment or towing-path, for the river-banks were covered with brushwood, and quite hidden in a bower of every variety of plants; and the festoons of the "cynauchum filiform," mentioned by Burchell, hanging from tree to tree, formed quite a network of verdure in their path; the bushman's knife, however, did not long remain inactive, and he cut down the obstructive branches without mercy. William Emery drank in the fragrant air, here especially impregnated with the camphor-like odor of the countless blooms of the diosma. Happily there were sometimes more open places along the bank devoid of vegetation, where the river flowed quietly, and abounded in fish, and these enabled the hunter and his companion to make better progress westward, so that by eleven o'clock they had gone about four miles. The wind being in the west, the roar of the cataract could not be heard at that distance, but on the other hand, all sounds below the falls were very distinct. William Emery and the hunter, as they stood, could see straight down the river for three or four miles. Chalk cliffs, 200 feet high, overhung and shut in its bed on either side.

"Let us stop and rest here," said the astronomer; "I haven't your hunter's legs, Mokoum, and am more used to the starry paths of the heavens than to those on *terra firma;* so let us have a rest; we can see three or four miles down the river from here, and if the steamer should turn that last bend we are sure to see it."

The young astronomer seated himself against a giant euphorbia, forty feet high, and in that position looked down the river, while the hunter, little used to sitting, continued to walk along the bank, and Top roused up clouds of wild birds, to which, however, his master gave no heed. They had been here about half an hour, when William Emery noticed that Mokoum, who was standing about 100 feet behind him, gave signs of a closer attention. Was it likely that he had seen the long-expected boat. The astronomer, leaving his mossy couch, started for the spot where the hunter stood, and came up to him in a very few moments.

"Do you see anything, Mokoum?" he asked.

"I *see* nothing, Mr. William," answered the bushman, "but it seems to me that there is an unusual murmur down the river, different to the natural sounds that are so familiar to my ears." And then, telling his companion to be quiet, he lay down with his ear to the ground, and listened attentively. In a few minutes he got up, and shaking his head, said, "I was mistaken; the noise I thought I heard was nothing but the breeze among the leaves or the murmur of the water over the stones at the edge; and yet——"

The hunter listened again, but again heard nothing.

"Mokoum," then said Emery, "if the noise you thought you heard is caused by the machinery of a steamboat, you would hear better by stooping to the level of the river; water always conducts sound more clearly and quickly than air."

"You are right, Mr. William," answered Mokoum, "for more than once I have found out the passage of a hippopotamus across the river in that way."

The bushman went nimbly down the bank, clinging to the creepers and tufts of grass on his way. When he got to the level of the river, he went in to his knees, and stooping down, laid his ear close to the water.

"Yes!" he exclaimed in a few minutes, "I was not mistaken; there is a sound, some miles down, as if the waters were being violently beaten; it is a continual monotonous splashing which is introduced into the current.

"Is it like a screw?" asked the astronomer.

"Perhaps it is, Mr. Emery; they are not far off."

William Emery did not hesitate to believe his companion's assertion, for he knew that the hunter was endowed with great delicacy of sense, whether he used his eyes, nose, or ears. Mokoum climbed up the bank again, and they determined to wait in that place, as they could easily see down the river from there. Half an hour passed, which to Emery, in spite of his calmness, appeared interminable. Ever so many times he fancied he saw the dim outline of a boat gliding along the river, but he was always mistaken. At last an exclamation from the bushman made his heart leap.

"Smoke!" cried Mokoum.

Looking in the direction indicated by the bushman, Emery could see a light streak rolling round the bend of the river; there was no longer any doubt. The vessel advanced rapidly, and he could soon make out the funnel pouring forth a torrent of black smoke mingling with white steam. They had evidently made up their fires to increase their

speed, so as to reach the appointed place on the proper day. The vessel was still about seven miles from the Falls of Morgheda. It was then twelve o'clock, and as it was not a good place for landing, the astronomer determined to return to the foot of the cataract; he told his plan to the hunter, who only answered by turning back along the path he had just cleared along the left bank of the stream. Emery followed, and, turning round for the last time at a bend in the river, saw the British flag floating from the stern of the vessel. The return to the falls was soon effected, and in an hour's time the bushman and the astronomer halted a quarter of a mile below the cataract; for there the shore, hollowed into a semicircle, formed a little cove, and as the water was deep right up to the bank, the steamboat could easily land its passengers. The vessel could not be far off now, and it had certainly gained on the two pedestrians, although they had walked so fast; it was not yet in sight, for the lofty trees which hung quite over the river-banks into the water, and the slope of the banks themselves, did not allow of an extensive view. But although they could not hear the sound made by the steam, the pulsing of the machinery broke in distinctly on the monotonous roar of the cataract; and as the whistling continued, it was evident that it was a signal from the boat to announce its arrival near the falls. The hunter replied by letting off his gun, the report being repeated with a crash by the echoes of the shore. At last the vessel was in sight, and William Emery and his companion were seen by those on board. At a sign from the astronomer the vessel turned, and glided quietly alongside the bank; a rope was thrown ashore, which the bushman seized and twisted round the broken stump of a tree, and immediately a tall man sprang lightly on the bank, and went towards the astronomer, whilst his companions landed in their turn. William Emery also advanced to meet the stranger, saying inquiringly, "Colonel Everest?"

"Mr. William Emery?" answered the Colonel.

The astronomer bowed and shook hands.

"Gentlemen," then said Colonel Everest, "let me introduce you to Mr. William Emery, of the Cape Town Observatory, who has kindly come as far as the Morgheda Falls to meet us."

Four of the passengers who stood near Colonel Everest bowed to the young astronomer, who did the same; and then the Colonel, with his British self-possession, introduced them officially, saying:

"Mr. Emery, Sir John Murray, of the county of Devon, your fellow-countryman; Mr. Matthew Strux, of the Poulkowa Observatory; Mr. Nicholas Palander, of the Helsingfors Observatory; and Mr. Michael Zorn, of the Kiew Observatory, three scientific gentlemen who represent that Russian Government in our international commission."

CHAPTER III

The Portage

THESE introductions over, William Emery put himself at the disposal of the new arrivals, for in his position of astronomer at the Cape, he was inferior in rank to Colonel Everest, a delegate of the English Government, and with Matthew Strux, Joint President of the Commission. He knew, as well, that he was a distinguished man of science, famous for his reductions of the nebulæ and his calculations of the occultations of the stars. He was a cold, methodical man, of about fifty years of age, every hour of his life being portioned out with

mathematical accuracy. Nothing unforeseen ever happened to him, and his punctuality in everything was like that of the stars in passing the meridian, and it might be said that all his doings were regulated by the chronometer. William Emery knew all this, and had therefore never doubted that the commission would arrive on the appointed day. During this time he was waiting for the Colonel to tell him the object of his mission to South Africa; but as he was still silent on the point, Emery thought it better not to ask any questions, as very likely the hour fixed in the Colonel's mind for the subject had not yet come.

Emery also knew by repute the wealthy Sir John Murray, who (almost a rival to Sir James Ross and Lord Elgin) was, although without office, an honor to England by his scientific labors. His pecuniary sacrifices to science were likewise considerable, for he had devoted $100,000 to the establishment of a giant reflector, a match for the telescope at Parson Town, by whose means the elements of a number of double stars had just been determined. He was a man of about forty years of age, with an aristocratic bearing, but whose character it was impossible to discover through his imperturbable exterior.

As to the three Russians—Strux, Palander, and Zorn—their names were also well known to William Emery, although he was not personally acquainted with them. Nicholas Palander and Michael Zorn paid a certain amount of deference to Matthew Strux, as was due to his position, if it had not been to his merit.

The only thing that Emery remarked was that they were in equal numbers, three English and three Russians; and the crew of the *Queen and Czar* (for that was the name of the steamboat) consisted of ten men, five English and five Russians.

"Mr. Emery," said Colonel Everest, when the introductions were over, "we are now as well acquainted as if we had traveled together from London to Cape Voltas. Besides, your labors have already earned you a just renown, and on that account I hold you in high esteem. It was at my request that the English Government appointed you to assist in our operations in South Africa."

William Emery bowed in acknowledgment, and thought that he was now going to hear the object of the scientific commission to the southern hemisphere; but still Colonel Everest did not explain it.

"Mr. Emery," he went on, "are your preparations complete?"

"Quite, Colonel," replied the astronomer. "According to the directions in Mr. Airy's letter, I left Cape Town a month ago, and went to the station at Lattakoo, and there I collected all the materials for an expedition into the interior of Africa—provisions, wagons, horses and bushmen. There is an escort of 100 armed men waiting for you at Lattakoo, and they will be under the command of a clever and celebrated hunter, whom I now beg to present to you, the bushman Mokoum."

"The bushman Mokoum!" cried the Colonel (if his usual cold tone could justify such a verb) "the bushman Mokoum! I know his name perfectly well."

"It is the name of a clever, brave African," added Sir John Murray, turning to the hunter, who was not at all discomposed by the grand airs of the Europeans.

"The hunter Mokoum," said William Emery, as he introduced his companion.

"Your name is well known in the United Kingdom, bushman," replied Colonel Everest. "You were the friend of Anderson and the guide of David Livingstone, whose friend I have the

honor of being. I thank you in the name of England, and I congratulate Mr. Emery on having chosen you as the chief of our caravan. Such a hunter as you must be a connoisseur of firearms, and as we have a very fair supply, I shall beg you to take your choice of the one which will suit you the best; we know that it will be in good hands."

A smile of satisfaction played round the bushman's lips, for although he was no doubt gratified by the recognition of his services in England, yet the Colonel's offer touched him the most: he then returned thanks in polite terms, and stepped aside, while Emery and the Europeans continued their conversation.

The young astronomer went through all the details of the expedition he had prepared, and the Colonel seemed delighted. He was anxious to reach Lattakoo as quickly as possible, as the caravan ought to start at the beginning of March, after the rainy season.

"Will you be kind enough to decide how you will get to the town, Colonel Everest?" said William Emery.

"By the Orange River, and one of its affluents, the Kuruman, which flows close to Lattakoo."

"True," replied the astronomer, "but however well your vessel may travel, it cannot possibly ascend the cataract of Morgheda!"

"We will go round the cataract, Mr. Emery," replied the Colonel, "and by making a land journey of a few miles, we can re-embark above the falls; and from there to Lattakoo, if I am not mistaken, the rivers are navigable for a vessel that does not draw much water."

"No doubt, Colonel," answered William Emery, "but this steamboat is too heavy."

"Mr. Emery," interrupted the Colonel, "this vessel is a masterpiece from Laird's yard in Liverpool. It can be taken to pieces, and is put together again with the greatest ease, a key and a few bolts being all that is required by men used to the work. You brought a wagon to the falls, did you not?"

"Yes, Colonel," answered Emery, "our encampment is not a mile away."

"Well, I must beg the bushman to have the wagon brought to the landing-place, and it will then be loaded with the portions of the vessel and its machinery, which also can be taken to pieces; and we shall then get to the spot where the Orange becomes navigable."

Colonel Everest's orders were obeyed. The bushman disappeared quickly in the underwood, promising to be back in less than an hour, and while he was gone, the steamboat was rapidly unloaded. The cargo was not very considerable; it consisted of some cases of philosophical instruments; a fair collection of guns of Purdey Moore's manufacture, of Edinburgh; some kegs of brandy, some canisters of preserved meats; cases of ammunition; portmanteaus reduced to the smallest size; tent-cloths and all their utensils, looking as if they had come out of a traveling-bazaar; a carefully packed gutta-percha canoe, which took up no more room than a well-folded counterpane; some materials for encamping, etc., etc.; and lastly, a fan-shaped mitrailleuse, a machine not then brought to perfection, but formidable enough to terrify any enemy who might come across their path. All these were placed on the bank; and the engine, of 8-horsepower, was divided into three parts: the boiler and its tubes; the mechanism, which was parted from the boiler by a turn of a key; and the screw attached to the false stern-post. When these had been successively carried away, the inside of the vessel was left free. Besides the space reserved for the machinery and the stores, it was divided into a fore-cabin for the use of the crew, and an aft-cabin occupied by Colo-

nel Everest and his companions. In the twinkling of an eye the partitions vanished, all the chests and bedsteads were lifted out and now the vessel was reduced to a mere shell thirty feet long, and composed of three parts, like the *Mâ-Robert,* the steam vessel used by Dr. Livingstone in his first voyage up the Zambesi. It was made of galvanized steel, so that it was light and at the same time resisting. The bolts, which fastened the plates over a framework of the same metal, kept them firm, and also prevented the possibility of a leakage. William Emery was truly astounded at the simplicity of the work and the rapidity with which it was executed. The wagon, under the guidance of Mokoum and the two Bochjesmen, had only arrived an hour when they were ready to load it. The wagon, rather a primitive vehicle, was mounted on four massive wheels, each pair being about twenty feet apart; it was a regular American "car" in length. This clumsy machine, with its creaking axles projecting a good foot beyond the wheels, was drawn by six tame buffaloes, two and two, who were extremely sensitive to the long goad carried by their driver. It required nothing less than such beasts as these to move the vehicle when heavily laden, for in spite of the adroitness of the "leader," it stuck in the mire more than once. The crew of the *Queen and Czar* now proceeded to load the wagon so as to balance it well everywhere. The dexterity of sailors is proverbial, and the lading of the vehicle was like play to the brave men. They laid the larger pieces of the boat on the strongest part of the wagon, immediately over the axles of the wheels, so that the cases, chests, barrels, and the lighter and more fragile packages easily found room between them. As to the travelers themselves, a four-mile walk was nothing to them. By three o'clock the loading was finished, and Colonel Everest gave the signal for starting. He and his companions, with William Emery as guide, took the lead, while the bushmen, the crew and the drivers of the wagon followed more slowly. They performed the journey without fatigue, for the slopes that led to the upper course of the Orange made their road easy, by making it longer, and this was a happy thing for the heavily laden wagon, as it would thus reach the goal more surely, if more slowly.

The different members of the commission clambered lightly up the side of the hill, and the conversation became general, but there was still no mention of the object of the expedition. The Europeans were admiring the splendid scenes that were opened to their view, for this grand nature so beautiful in its wildness, charmed them as it had charmed the young astronomer, and their voyage had not yet surfeited them with the natural beauties of this African region, though they observed everything with a quiet admiration, and, English-like, would not do anything that might seem "improper." However, the cataract drew forth some graceful applause, and, although they clapped perhaps with only the tips of their fingers, yet it was enough to show that "nil admirari" was not quite their motto. Besides, William Emery thought it his duty to do the honors of South Africa to his guests; for he was at home, and like certain over-enthusiastic citizens, he did not spare a detail of his African park. Towards half-past four they had passed the cataract of Morgheda, and being now on level ground, the upper part of the river lay before them as far as their eye could reach, and they encamped on the bank to await the arrival of the wagon. It appeared at the top of the hill about five o'clock, having accomplished the journey in safety, and Colonel Everest ordered it

to be unloaded immediately, announcing that they were to start at daybreak the next morning. All the night was passed in different occupations. The hull of the vessel was put together again in less than an hour: then the boiler and machinery were put into place; the metal partitions were fixed between the cabins; the store-rooms were refurnished, and the different packages neatly arranged on board, and everything done so quickly that it told a great deal in favor of the crew of the *Queen and Czar*. These Englishmen and Russians were picked men, clever and well disciplined, and thoroughly to be depended on. The next day, the 1st of February, the boat was ready to receive its passengers at daybreak. Already there was a volume of black smoke pouring from the funnel, and the engineer, to put the machinery in motion, was causing jets of white steam to fly across the smoke. The machine being high pressure, without a condenser, the steam escaped at every stroke of the piston, according to the system applied to locomotives, and as to the boiler, with its ingeniously contrived tubes, presenting a large surface to the furnace, it only required half an hour to furnish a sufficient quantity of steam. They had laid in a good stock of ebony and guiacum, which were plentiful in the neighborhood, and they were now feeding the great fire with this valuable wood.

At six o'clock Colonel Everest gave the signal for starting, and the passengers and crew went on board the *Queen and Czar*. The hunter, who was acquainted with the course of the river, followed, leaving two Bochjesmen to take the wagon back to Lattakoo. Just as the vessel was slipping its cable, Colonel Everest turned to the astronomer, and said:

"By-the-bye, Mr. Emery, you know why we have come here?"

"I have not the least idea, Colonel."

"It is very simple, Mr. Emery; we have come to measure an arc of meridian in South Africa."

CHAPTER IV

The Meter

THE idea of an invariable and constant system of measurement, of which nature herself should furnish the exact value, may be said to have existed in the mind of man from the earliest ages. It was of the highest importance, however, that this measurement should be accurately determined, whatever had been the cataclysms of which our earth had been the scene, and it is certain that the ancients felt the same, though they failed in methods and appliances for carrying out the work with sufficient accuracy. The best way of obtaining a constant measurement was to connect it with the terrestrial sphere, whose circumference must be considered as invariable, and then to measure the whole or part of that circumference mathematically. The ancients had tried to do this, and Aristotle, according to some contemporary philosophers, reckoned that the stadium, or Egyptian cubit, formed the hundred-thousandth part of the distance between the Pole and the Equator, and Eratosthenes, in the time of the Ptolemies, calculated the value of a degree along the Nile, between Syene and Alexandria, pretty correctly; but Posidonius and Ptolemy were not sufficiently accurate in the same kind of geodetic operations that they undertook; neither were their successors.

Picard, for the first time in France, began to regulate the methods that were used for measuring a degree, and in 1669, by measuring the celestial and terrestrial arcs between Paris and Ami-

ens, found that a degree was equal to 57,000 toises, equivalent to 364,876 English feet, or about 69.1 miles. Picard's measurement was continued either way across the French territory as far as Dunkirk and Collioure by Dominic Cassini and Lahire (1683-1718), and it was verified in 1739, from Dunkirk to Perpignan, by Francis Cassini and Lacaille, and at length Méchain carried it as far as Barcelona in Spain; but after his death (for he succumbed to the fatigue attending his operation) the measurement of the meridian in France was interrupted until it was subsequently taken up by Arago and Biot in 1807. These two men prolonged it as far as the Balearic Isles, so that the arc now extended from Dunkirk to Formentera, being equally divided by the parallel of latitude 45° N., half way between the Pole and the Equator; and under these conditions it was not necessary to take the depression of the earth into account in order to find the value of the quadrant of the meridian. This measurement gave 57,025 toises as the mean value of an arc of a degree in France.

It can be seen that up to that time Frenchmen especially had undertaken to determine that delicate point, and it was likewise the French Convention that, according to Talleyrand's proposition, passed a resolution in 1790, charging the Academy of Sciences to invent an invariable system of weights and measures. Just at that time the statement signed by the illustrious names of Borda, Lagrange, Laplace, Monge and Condorcet, proposed that the unit of measurement should be the *meter,* the ten-millionth part of the quadrant of the meridian; and that the unit of weight should be the *gramme,* a cubic centimeter of distilled water at the freezing-point; and that the multiples and subdivisions of every measure should be formed decimally.

Later, the determination of the value of a terrestrial degree was carried on in different parts of the world, for the earth being not spherical, but elliptic, it required much calculation to find the depression at the poles.

In 1736, Maupertius, Clairaut, Camus, Lemonnier, Outhier, and the Swedish Celsius measured a northern arc in Lapland, and found the length of an arc of a degree to be 57,419 toises. In 1745, La Condamine, Bouguer, and Godin set sail for Peru, where they were joined by the Spanish officers, Juan and Antonio Ulloa, and they then found that the Peruvian arc contained 56,737 toises.

In 1752, Lacalle reported 57,037 toises as the length of the arc he had measured at the Cape of Good Hope.

In 1754, Father Boscowitch and Father le Maire began a survey of the Papal States, and in the course of their operations found the arc between Rome and Rimini to be 56,973 toises.

In 1762 and 1763, Beccaria reckoned the degree in Piedmont at 57,468 toises, and in 1768 the astronomers Mason and Dixon, in North America, on the confines of Maryland and Pennsylvania, found that the value of the degree in America was 56,888 toises.

Since the beginning of the nineteenth century numbers of other arcs have been measured—in Bengal, the East Indies, Piedmont, Finland, Courland, East Prussia, Denmark, etc., but the English and Russians were less active than other nations in trying to decide this delicate point, their principal geodetic operation being undertaken by General Roy, in 1784, for the purpose of determining the difference of longitude between Paris and Greenwich.

It may be concluded from all the above-mentioned measurements that the mean value of a degree is 57,000 toises, or 25 ancient French leagues, and by multiplying this mean value by the 360

degrees contained in the circumference, it is found that the earth measures 9,000 leagues around. But, as may be seen from the figures above, the measurements of the different arcs in different parts of the world do not quite agree. Nevertheless, by taking this average of 57,000 toises for the value of a degree, the value of the meter, that is to say, the ten-millionth part of the quadrant of the meridian, may be deduced, and is found to be 0.513074 of the whole line, or 39.37079 English inches. In reality, this value is rather too small, for later calculations (taking into account the depression of the earth at the poles, which is 1/299./15 and not 1/134, as was thought at first) now gives nearly 10,000,856 meters instead of 10,000,000 for the length of the quadrant of the meridian. The difference of 856 meters is hardly noticeable in such a long distance; but nevertheless, mathematically speaking, it cannot be said that the meter, as it is now used, represents the ten-millionth part of the quadrant of the terrestrial meridian exactly; there is an error of about 1/5000 of a line, *i. e.* 1/5000 of the twelfth part of an inch.

The meter, thus determined, was still not adopted by all the civilized nations. Belgium, Spain, Piedmont, Greece, Holland, the old Spanish colonies, the republics of the Equator, New Granada and Costa Rica, took a fancy to it immediately; but notwithstanding the evident superiority of this metrical system to every other, England had refused to use it. Perhaps if it had not been for the political disturbances which arose at the close of the eighteenth century, the inhabitants of the United Kingdom would have accepted the system, for when the Constituent Assembly issued its decree on the 8th of May, 1790, the members of the Royal Society in England were invited to co-operate with the French Academicians. They had to decide whether the measure of the meter should be founded on the length of the pendulum that beats the sexagesimal second, or whether they should take a fraction of one of the great circles of the earth for a unit of length; but events prevented the proposed conference, and so it was not until the year 1854 that England, having long seen the advantage of the metrical system, and that scientific and commercial societies were being founded to spread the reform, resolved to adopt it. But still the English Government wished to keep their resolution a secret until the new geodetic operations that they had commenced should enable them to assign a more correct value to the terrestrial degree, and they thought they had better act in concert with the Russian Government, who were also hesitating about adopting the system. A Commission of three Englishmen and three Russians was therefore chosen from among the most eminent members of the scientific societies, and we have seen that they were Colonel Everest, Sir John Murray and William Emery, for England; and Matthew Strux, Nicholas Palander, and Michael Zorn, for Russia. The international Commission having met in London, decided first of all that the measure of an arc of meridian should be taken in the Southern hemisphere, and that another arc should subsequently be measured in the Northern hemisphere, so that from the two operations they might hope to deduce an exact value which should satisfy all the conditions of the programme. It now remained to choose between the different English possessions in the Southern hemisphere, Cape Colony, Australia, and New Zealand. The two last, lying quite at the antipodes of Europe, would involve the Commission in a long voyage, and, besides, the Maoris and Australians, who were often at war with their in-

vaders, might render the proposed operation difficult; while Cape Colony, on the contrary, offered real advantages. In the first place, it was under the same meridian as parts of European Russia, so that after measuring an arc of meridian in South Africa, they could measure a second one in the empire of the Czar, and still keep their operations a secret; secondly, the voyage from England to South Africa was comparatively short; and thirdly, these English and Russian philosophers would find an excellent opportunity there of analyzing the labors of the French astronomer Lacaille, who had worked in the same place, and of proving whether he was correct in giving 57,037 toises as the measurement of a degree of meridian at the Cape of Good Hope. It was therefore decided that the geodetic operation should be commenced at the Cape, and as the two Governments approved of the decision, large credits were opened, and two sets of all the instruments required in a triangulation were manufactured. The astronomer William Emery was asked to make preparations for an exploration in the interior of South Africa, and the frigate *Augusta*, of the royal navy, received orders to convey the members of the Commission and their suite to the mouth of the Orange River.

It should here be added, that besides the scientific question, there was also a question of national vain-glory that excited these philosophers to join in a common labor; for, in reality, they were anxious to out-do France in her numerical calculations, and to surpass in precision the labors of her most illustrious astronomers, and that in the heart of a savage and almost unknown land. Thus the members of the Anglo-Russian Commission had resolved to sacrifice everything, even their lives, in order to obtain a result that should be favorable to science, and at the same time glorious for their country. And this is how it came to pass that the astronomer William Emery found himself at the Morgheda Falls, on the banks of the Orange River, at the end of January, 1854.

CHAPTER V

A Hottentot Village

THE voyage along the upper course of the river was quickly accomplished, and although the weather soon became rainy, the passengers, comfortably installed in the ship's cabin, suffered no inconvenience from the torrents of rain which usually fall at that season. The *Queen and Czar* shot along swiftly, for there were neither rapids nor shallows, and the current was not sufficiently strong to retard her progress. Every aspect of the river-banks was enchanting; forest followed upon forest, and quite a world of birds dwelt among the leafy branches. Here and there were groups of trees belonging to the family of the "proteaceæ," and especially the "wagenboom" with its reddish marble-wood forming a curious contrast with its deep blue leaves and large pale yellow flowers; then there were the "zwartebasts" with their black bark, and the "karrees" with dark evergreen foliage. The banks were shaded everywhere by weeping willows, while the underwood extended beyond for several miles. Every now and then vast open tracts presented themselves unexpectedly, large plains, covered with innumerable colocynths, mingled with "sugar-bushes," out of which flew clouds of sweet-singing little birds, called "suiker-vogels" by the Cape colonists. The winged world offered many varieties, all of which were pointed out to Sir John Murray by the bushman. Sir John

was a great lover of game, both furry and feathered, and thus a sort of intimacy arose between him and Mokoum, to whom, according to Colonel Everest's promise, he had given an excellent long range rifle, made on the Pauly system. It would be useless to attempt a description of the bushman's delight when he found himself in possession of such a splendid weapon.

The two hunters understood each other well, for though so learned, Sir John Murray passed for one of the most brilliant fox-hunters in old Caledonia, and he listened to the bushman's stories with an interest amounting to envy. His eyes sparkled when Mokoum showed him the wild ruminants in the woods; here a herd of fifteen to twenty giraffes; there, buffaloes six feet high, with towering black horns; farther on, fierce gnus with horses' tails; and again herds of "caamas," a large kind of antelope with bright eyes, and horns forming a threatening looking triangle; and everywhere, in the dense forests as well as in the open plains, the innumerable varieties of antelopes which abound in Southern Africa; the spurious chamois, the gems-bok, the gazellè, the duiker-bok, and the spring-bok. Was not all this something to tempt a hunter, and could the fox-hunts of the Scottish low-lands vie with the exploits of a Cumming, an Anderson, or a Baldwin? It must be confessed that Sir John Murray's companions were less excited than himself at these magnificent specimens of wild game.

William Emery was watching his colleagues attentively, and trying to discover their character, under their cold exterior. Colonel Everest and Matthew Strux, men of about the same age, were equally cold, reserved, and formal; they always spoke with a measured slowness, and from morning to night it seemed as if they had never met before. That any intimacy should ever be established between two such important personages was a thing not to be hoped for; two icebergs, placed side by side, would join in time, but two scientific men, each holding a high position, never.

Nicholas Palander, a man of about fifty-five years of age, was one of those who have never been young and who will never be old. The astronomer of Helsingfors, constantly absorbed in his calculations, might be a very admirably constructed machine, but still he was nothing but a machine, a kind of abacus, or universal reckoner. He was the calculator of the Anglo-Russian Commission, and one of those prodigies who work out multiplications to five figures in their head, like a fifty-year-old Mondeux.

Michael Zorn more nearly resembled William Emery in age, enthusiasm, and good humor. His amiable qualities did not prevent his being an astronomer of great merit, having attained an early celebrity. The discoveries made by him at the Kiew Observatory concerning the nebula of Andromeda, had attracted attention in scientific Europe, and yet with this undoubted merit he had a great deal of modesty, and was always in the background. William Emery and Michael Zorn were becoming great friends, united by the same tastes and aspirations; and most generally they were talking together, while Colonel Everest and Matthew Strux were coldly watching each other, and Palander was mentally extracting cube roots without noticing the lovely scenes on the banks, and Sir John Murray and the bushman were forming plans for hunting down whole hecatombs of victims.

No incident marked the voyage along the upper course of the Orange. Sometimes the granite cliffs which shut in the winding bed of the river seemed to forbid further progress, and often the

wooded islands which dotted the current seemed to render the route uncertain; but the bushman never hesitated, and the *Queen and Czar* always chose the right route, and passed round the cliffs without hindrance. The helmsman never had to repent of having followed Mokoum's directions.

In four days the steamboat had passed over the 240 miles between the cataract of Morgheda and the Kuruman, an affluent which flowed exactly past the town of Lattakoo, whither Colonel Everest's expedition was bound. About thirty leagues above the falls the river bends from its general direction, which is east and west, and flows southeast as far as the acute angle which the territory of Cape Colony makes in the north, and then turning to the northeast, it loses itself in the wooded country of the Transvaal Republic. It was early in the morning of the 5th of February, in a driving rain, that the *Queen and Czar* arrived at Klaarwater, a Hottentot village, close to the meeting of the Orange and Kuruman. Colonel Everest, unwilling to lose a moment, passed quickly by the few Boschjesman cabins that form the village, and under the pressure of her screw, the vessel began to ascend the affluent. The rapid current was to be attributed, as the passengers remarked, to a peculiarity in the river, for the Kuruman being wide at its source, was lessened as it descended, by the influence of the sun's rays; but at this season, swollen by the rains, and further increased by the waters of a sub-affluent, the Moschona, it became very deep and rapid. The fires were therefore made up, and the vessel ascended the Kuruman at the rate of three miles an hour.

During the voyage the bushman pointed out a good many hippopotami in the water; but these great pachyderms, clumsy, thickset beasts, from eight to ten feet long, which the Dutch at the Cape call "sea-cows," were by no means of an aggressive nature, and the hissing of the steam and the beating of the screw quite frightened them, the boat appearing to them like some great monster which they ought to distrust, and in fact, the arsenal on board would have rendered approach very difficult. Sir John Murray would have very much liked to try his explosive bullet on the fleshy masses, but the bushman assured him that there would be no lack of hippopotami in the more northerly rivers, so he determined to wait for a more favorable opportunity.

The 150 miles which separated the mouth of the Kuruman from the station of Lattakoo were traversed in fifty hours, and on the 7th of February the travelers had reached the end of their journey. As soon as the steamboat was moored to the bank which served as a quay, a man of fifty years of age, with a grave air but kind countenance, stepped on board, and offered his hand to William Emery. The astronomer introduced the new-comer to his traveling comopanions as "The Rev. Thomas Dale, of the London Missionary Society, Governor of the station of Lattakoo."

The Europeans bowed to Mr. Dale, who gave them welcome, and put himself at their service.

The town of Lattakoo, or rather the village of that name, is the most northerly of the Cape Missionary stations, and is divided into Old and New. The first, which the *Queen and Czar* now reached, had 12,000 inhabitants at the beginning of the century, but they have since emigrated to the northeast, and the town, now fallen into decay, has been replaced by New Lattakoo, which is built close by, on a plain which was formerly covered with acacias, and thither Mr. Dale conducted the Europeans. It consisted of about forty

groups of houses, and contained 5,000 or 6,000 inhabitants of the tribe of the Bechuanas. Dr. Livingstone stayed in this town for three months before his first voyage up the Zambesi in 1840, previous to crossing the whole of Central Africa, from the Bay of Leander to the port of Kilmana on the coast of Mozambique.

When they reached New Lattakoo, Colonel Everest presented a letter from Dr. Livingstone which commended the Anglo-Russian Commission to his friends in South Africa. Mr. Dale read it with much pleasure, and returned it to the Colonel, saying that he might find it useful on his journey, as the name of David Livingstone was known and honored throughout that part of Africa.

The members of the Commission were lodged in the missionary establishment, a large house built on an eminence and surrounded by an impenetrable hedge like a fortification. The Europeans could be more comfortably lodged here than with the Bechuanas; not that their dwellings were not kept properly in order; on the contrary, the smooth clay floors did not show a particle of dust, and the long-thatched roofs were quite rainproof; but, at best, their houses were little better than huts with a round hole for a door, hardly large enough to admit a man; moreover, they all lived in common, and close contact with the Bechuanas would scarcely have been agreeable.

The chief of the tribe, one Moulibahan, lived at Lattakoo, and thought it right to come and pay his respects to the Europeans. He was rather a fine man, without the thick lips and flat nose of the negro, with a round face not so shrunken in its lower part as that of the other Hottentots. He was dressed in a cloak of skins, sewn together with considerable art, anad an apron called a "pujoke." He wore a leather skull-cap, and sandals of ox-hide; ivory rings were strung round his arms, and from his ears hung brass plates about four inches long—a kind of earring—which is also a charm; an antelope's tail stood up his skull-cap, and his hunting stick was surmounted by a tuft of small black ostrich feathers. The natural color of his body was quite invisible through the thick coating of ochre with which he was besmeared from head to foot, while some ineffaceable incisions in his legs denoted the number of enemies he had slain.

The chief, as grave as Matthew Strux himself, stepped up to the Europeans and took them in turn by the nose. The Russians permitted this to be done quite gravely, the English rather more reluctantly, but still it had to be done, for according to African custom, it denoted a solemn engagement to fulfill the duties of hospitality to the Europeans. When the ceremony was over, Moulibahan retired without having uttered a word.

"And now that we are naturalized Bechuanas," said Colonel Everest, "let us begin our operations without losing a day or an hour."

And indeed no time was lost; still, such is the variety of detail required in the organization of an expedition of this character, the Commission was not ready to start until the beginning of March. That, however, was the time appointed by Colonel Everest; because then the rainy season just being over, the water, preserved in the fissures of the earth, would furnish a valuable resource to travelers in the desert.

On the 2d of March, then, the whole caravan, under Mokoum's command, was ready. The Europeans took farewell of the missionaries at Lattakoo, and left the village at seven o'clock in the morning.

"Where are we going, Colonel?" asked William Emery, as the caravan

passed the last house in town.

"Straight on, Mr. Emery," answered the Colonel, "until we reach a suitable place for establishing a base."

At eight o'clock the caravan had passed over the low shrubby hills which skirt the town, and soon the desert, with its dangers, fatigues and risks, lay unfolded before the travelers.

CHAPTER VI

Acquaintance and Friendship

THE escort under the bushman's command was composed of 100 men, all Bochjesmen—an industrious, good-tempered people, capable of enduring great physical fatigue. In former times, before the arrival of the missionaries, these Bochjesmen were a lying, inhospitable race, thinking of nothing but murder and pillage, and taking advantage of an enemy's sleep to massacre him. To a great extent the missionaries have modified these barbarous habits, but the natives are still more or less farm-pillagers and cattle-lifters.

Ten wagons, like the vehicle which Mokoum had taken to the Morgheda Falls, formed the bulk of the expedition. Two of these were like moving houses, fitted up as they were with a certain amount of comfort, and served as an encampment for the Europeans; so that Colonel Everest and his companions were followed about by a wooden habitation with dry flooring, and well tiled with water-proof cloth, and furnished with beds and toilet furniture. Thus, on arriving at each place of encampment, the tent was always ready pitched. Of these wagons one was appropriated to Colonel Everest and his countrymen, Sir John Murray and William Emery; the other was used by the Russians, Matthew Strux, Nicholas Palandera and Michael Zorn. Two more, arranged in the same way, belonged, one to the five Englishmen and the other to the five Russians who composed the crew of the *Queen and Czar*.

The hull and machinery of the steamboat, taken to pieces and laid on one of the wagons, followed the travelers, in case the Commission might come across some of the numerous lakes which are found in the interior of the continent.

The remaining wagons carried the tools, provisions, baggage, arms and ammunition, as well as the instruments required for the proposed trigonometric survey. The provisions of the Bochjesmen consisted principally of antelope, buffalo or elephant meat, preserved in long strips, being dried in the sun or by a slow fire; thus economizing the use of salt, here very scarce. In the place of bread, the Bochjesmen depended on the earth-nuts of the arachis, the bulbs of various species of mesembryanthemums, and other native productions. Animal food would be provided by the hunters of the party, who, adroitly employing their bows and lances, would scour the plains and revictual the caravan.

Six native oxen, long-legged, high-shouldered, and with great horns, were attached to each wagon with harness of buffalo hide. Thus the primitive vehicles moved slowly though surely on their massive wheels ready alike for heights or valleys. For the travelers to ride there were provided small black or gray Spanish horses, good-tempered, brave animals, imported from South America, and much esteemed at the Cape. Among the troops of quadrupeds, were also half a dozen tame quaggas, a kind of ass with plump bodies and slender legs, who make a noise like the barking of a dog. They were to be

used in the smaller expeditions necessary to the geodetic operations, and were adapted to carry the instruments where the wagons could not venture. The only exception to the others was the bushman, who rode a splendid zebra with remarkable grace and dexterity. This animal (the beauty of whose coat with its brown stripes especially excited the admiration of the connoisseur Sir John Murray) was naturally defiant and suspicious, and would not have borne any other rider than Mokoum, who had broken it for his own use. Some dogs of a half savage breed, sometimes wrongly called "hyena-hunters," ran by the side of the wagons, their shape and long ears reminding one of the European brach-hound.

Such was the caravan which was about to bury itself in the deserts. The oxen advanced calmly under the guidance of their drivers, ever and again, striking them in the flank with their "jambox"; and it was strange to see the troop, winding around the hills in marching order. After leaving Lattakoo, whither was the expedition going? Colonel Everest had said "Straight on"; and indeed he and Matthew Strux could not yet follow a fixed course. What they wanted, before commencing their trigonometrical operations, was a vast level plain, on which to establish the base of the first of the triangles, which, like a network, were to cover for several degrees the southern part of Africa. The Colonel explained to the bushman what he wanted, and with the calmness of one to whom scientific language is familiar, talked to him of triangles, adjacent angles, bases, meridians, zenith distances, and the like. Mokoum let him go for a few moments, then interrupted him with an impatient movement, saying, "Colonel, I don't know anything about your angles, bases, and meridians. I don't understand even in the least what you are going to do in the desert; but that is your business. You are asking for a large, level plain; oh, well, I can find you that."

And at his orders, the caravan, having just ascended the Lattakoo hills, turned down again towards the southwest. This took them rather more to the south of the village towards the plain watered by the Kuruman, and here the bushman expected to find a suitable place for the Colonel's plans. From that day, he always took the head of the caravan. Sir John Murray, well mounted, never left him, and from time to time the report of a gun made his colleagues aware that he was making acquaintance with the African game. The Colonel, quite absorbed in contemplating the difficulties of the expedition, let his horse carry him on. Matthew Strux, sometimes on horseback, sometimes in the wagon, according to the nature of the ground, seldom opened his lips. Nicholas Palander, as bad a rider as could be, was generally on foot; at other times he shut himself up in his vehicle, and there lost himself in the profoundest mathematical abstractions.

Although William Emery and Michael Zorn occupied separate wagons at night, they were always together when the caravan was on the march. Every day and every incident of the journey bound them in a closer friendship. From one stage to another they rode, talked, and argued together. Sometimes they fell behind the train, and sometimes rode on several miles ahead of it, when the plain extended as far as they could see. They were free here and lost amidst the wildness of nature. How they forgot figures and problems, calculations and observations, and chatted of everything but science! They were no longer astronomers contemplating the starry firmament, but were more like two youths escaped from school, reveling in the dense forests and boundless plains. They

laughed like ordinary mortals. Both of them had excellent dispositions, open, amiable, and devoted, forming a strange contrast to Colonel Everest and Matthew Strux, who were formal, not to say stiff. These two chiefs were often the subject of their conversations, and Emery learnt a good deal about them from his friend.

"Yes," said Michael Zorn, that day, "I watched them well on board the *Augusta*, and I profess to think they are jealous of each other. And if Colonel Everest appears to be at the head of things, Matthew Strux is not less than his equal; the Russian Government has clearly established his position. One chief is as imperious as the other; and besides, I tell you again, there is the worst of all-jealousy between them, the jealousy of the learned."

"And that for which there is the least occasion," answered Emery, "because in discoveries everything has its value, and each derives equal benefit. But, my dear Zorn, if, as I believe, your observations are correct, it is unfortunate for our expedition; in such a work there ought to be a perfect understanding."

"No doubt," replied Zorn, "and I fear that understanding does not exist. Think of our confusion, if every detail, the choice of a base, the method of calculating, the position of the stations, the verification of the figures, open a fresh discussion every time! Unless I am much mistaken I forebode a vast deal of quibbling when we come to compare our registers, and the observations we shall have made to the minutest fraction."

"You frighten me," said Emery. "It would be sorrowful to carry an enterprise of this kind so far, and then to fail for want of concord. Let us hope that your fears may not be realized."

"I hope they may not," answered the young Russian; "but I say again, I assisted at certain scientific discussions on the voyage, which showed me that both Colonel Everest and his rival are undeniably obstinate, and that at heart there is a miserable jealousy between them."

"But these two gentlemen are never apart," observed Emery. "You never find one without the other."

"True," replied Zorn, "they are never apart all day long, but then they never exchange ten words; they only keep watch on each other. If one doesn't manage to annihilate the other, we shall indeed work under deplorable conditions."

"And for yourself," asked Wiliam, hesitatingly, "which of the two would you wish——"

"My dear William," replied Zorn with much frankness, "I shall loyally accept him as chief who can command respect as such. This is a question of science, and I have no prejudice in the matter. Matthew Strux and the Colonel are both remarkable and worthy men; England and Russia should profit equally from their labors; therefore it matters little whether the work is directed by an Englishman or a Russian. Are you not of my opinion?"

"Quite," answered Emery; "therefore do not let us be distracted by absurd prejudices, and let us, as far as possible, use our efforts for the common good. Perhaps it will be possible to ward off the blows of the two adversaries; and besides, there is your fellow countryman, Nicholas Palander——"

"He!" laughed Zorn, "he will neither see, hear, nor comprehend anything! He would make calculations to any extent; but he is neither Russian, Prussian, English or Chinese; he is not even an inhabitant of this sublunary sphere; he is Nicholas Palander, that's all."

"I cannot say the same for my countryman, Sir John Murray," said Emery. "He is a thorough Englishman, and a most determined hunter, and he would sooner follow the traces of an

elephant and giraffe, than give himself any trouble about a scientific argument. We must therefore depend upon ourselves, Zorn, to neutralize the antipathy between our chiefs. Whatever happens, we must hold together."

"Ay, whatever happens," replied Zorn, holding out his hand to his friend.

The bushman still continued to guide the caravan down toward the southwest. At midday on the 4th of March, it reached the base of the long wooded hills which extend from Lattakoo. Mokoum was not mistaken; he had led the expedition toward the plain, but it was still undulated, and therefore unfitted for an attempt at triangulation. The march continued uninterrupted, and Mokoum rode at the head of the riders and wagons, while Sir John Murray, Emery, and Zorn pushed on in advance. Toward the end of the day, they all arrived at a station occupied by one of the wandering "boers," or farmers, who are induced by the richness of the pastureland to make temporary abodes in various parts of the country.

The colonist, a Dutchman, and head of a large family, received the Colonel and his companions most hospitably, and would take no remuneration in return. He was one of those brave, industrious men, whose slender capital, intelligently employed in the breeding of oxen, cows, and goats, soon produces a fortune. When the pasturage is exhausted, the farmer, like a patriarch of old, seeks for new springs and fertile prairies, pitching his camp afresh where the conditions seem favorable.

The farmer opportunely told Colonel Everest of a wide plain, fifteen miles away, which would be found quite flat. The caravan started early next morning at daybreak. The only incident that broke the monotory of the long morning march, was Sir John Murray's taking a shot at a distance of more than 1,000 yards, at a gnu, a curious animal about five feet high, with the muzzle of an ox, a long white tail, and pointed horns. It fell with a heavy groan, much to the astonishment of the bushman, who was surprised at seeing the animal struck at such a distance. The gnu generally affords a considerable quantity of excellent meat, and was accordingly in high esteem among the hunters of the caravan.

The site indicated by the farmer was reached about mid-day. It was a boundless prairie stretching to the north without the slightest undulation. No better spot for measuing a base could be imagined, and the bushman, after a short investigation, returned to Colonel Everest with the announcement that they had reached the place they were seeking.

CHAPTER VII

The Base of the Triangle

THE work undertaken by the Commission was a triangulation for the purpose of measuring an arc of meridian. Now the direct measurement of one or more degrees by means of metal rods would be impracticable. In no part of the world is there a region so vast and unbroken as to admit of so delicate an operation. Happily, there is an easier way of proceeding by dividing the region through which the meridian passes into a number of imaginary triangles, whose solution is comparatively easy.

These triangles are obtained by observing signals, either natural or artificial, such as church-towers, posts, or reverberatory lamps, by means of the theodolite or repeating-circle. Every signal is the vertex of a triangle, whose angles are exactly determined by the instruments, so that a good observer with a proper telescope can take the bearings of

any object whatever, a tower by day, or a lamp by night. Sometimes the sides of the triangles are many miles in length, and when Arago connected the coast of Valencia in Spain with the Baleric Islands, one of the sides measured 422,555 toises. When one side and two angles of any triangle are known, the other sides and angle may be found; by taking, therefore, a side of one of the known triangles for a new base, and by measuring the angles adjacent to the base, new triangles can be successfully formed along the whole length of the arc; and since every straight line in the network of triangles is known, the length of the arc can be easily determined. The values of the sides and angles may be obtained by the theodolite and repeating circle, but the *first* side, the base of the whole system, must be actually measured on the ground, and this operation requires the utmost care.

When Delambre and Méchain measured the meridian of France from Dunkirk to Barcelona, they took for their base a straight line, 12,150 mèters in length, in the road from Melun to Lieusaint, and they were no less than 42 days in measuring it. Colonel Everest and Matthew Strux designed proceeding in the same way, and it will be seen how much precision was necessary.

The work was begun on the 5th of March, much to the astonishment of the Bochjesmen, who could not at all understand it. Mokoum thought it strange for these learned men to measure the earth with rods six feet long; and anyway, he had done his duty; they had asked him for a level plain and he had found it for them.

The place was certainly well chosen. Covered with dry, short grass, the plain was perfectly level as far as the horizon. Behind lay a line of hills forming the southern boundary of the Kalahari desert; toward the north the plain seemed boundless. To the east, the sides of the table-land of Lattakoo disappeared in gentle slopes; and in the west, where the ground was lower, the soil became marshy, as it imbibed the stagnant water which fed the affluents of the Kuruman.

"I think, Colonel Everest," said Strux, after he had surveyed the grassy level, "that when our base is established, we shall be able here also to fix the extremity of our meridian.

"Likely enough," replied the Colonel. "We must find out too, whether the arc meets with any obstacles that may impede the survey. Let us measure the base, and we will decide afterward whether it will be better to join it by a series of auxiliary triangles to those which the arc must cross."

They thus resolved to proceed to the measurement of the base. It would be a long operation, for they wanted to obtain even more correct results than those obtained by the French philosophers at Melun. This would be a matter of some difficulty; since when a new base was measured afterward near Pepignan to verify the calculations, there was only an error of 11 inches in a distance of 33,000 toises (70,339½ feet).

Orders were given for encamping, and a Bochjesman village, a kind of kraal, was formed on the plain. The wagons were arranged in a circle, the English and Russian flags floating over their respective quarters. The center was common ground. The horses and buffaloes, which by day grazed outside, were driven in by night to the interior, to save them from attacks of the wild beasts around.

Mokoum took upon himself to arrange the hunting expedition for revictualing; and Sir John Murray, whose presence was not indispensable in the measurement of the base, looked after the provisions, and served out the rations of

preserved meat and fresh venison. Thanks to the skill and experience of Mokoum and his companions, game was never wanting. They scoured the district for miles around, and the report of their guns resounded at all hours.

The survey began on the next day, Zorn and Emery being charged with the preliminaries.

"Come along," said Zorn, "and good luck be with us."

The primary operation consisted in tracing a line on the ground where it was especially level. This chanced to be from the S. E. to N. W., and pickets being placed at short intervals to mark the direction, Zorn carefully verified the correctness of their position by means of the cross wires of his telescope. For more than eight miles (the proposed length of the base) was the measurement continued, and the young men performed their work with scrupulous fidelity.

The next step was to adjust the rods for the actual measurement, apparently a very simple operation, but which, in fact, demands the most continuous caution, as the success of a triangulation in a great measure is contingent on its preciseness.

On the morning of the 10th, twelve wooden pedestals were planted along the line, securely fastened in their position, and prepared to support the rods. Colonel Everest and Matthew Strux, assisted by their young coadjutors, placed their rods in position, and Nicholas Palander, stood ready, pencil in hand, to write down in a double register the figures transmitted to him.

The rods employed were six in number, and exactly two toises in length. They were made of platinum, as being (under ordinary circumstances) unaffected by any condition of the atmosphere. In order, however, to provide against any change of temperature, each was covered with a rod of copper somewhat shorter than itself, and a microscopic vernier was attached, to indicate any contraction or expansion that might occur. The rods were next placed lengthwise, with a small interval between each, in order to avoid the slight shock which might result from immediate contact. Colonel Everest and Matthew Strux with their own hands placed the first rod. About a hundred toises farther on, they had marked a point of sight, and as the rods were each provided with iron projections, it was not difficult to place them exactly in the proper direction. Emery and Zorn, lying on the ground, saw that the projection stood exactly in the middle of the sight.

"Now," said Colonel Everest, "we must define our exact starting point. We will drop a line from the end of our first rod, and the will definitely mark the extremity of our base."

"Yes," answered Strux, "but ye must take into account the radius of the line.

"Of course," said the Colonel.

The starting-point determined, the work went on. The next proceeding was to determine the inclination of the base with the horizon.

"We do not, I believe, pretend," said Colonel Everest, " to place the rod in a position which is perfectly horizontal."

"No," answered Strux, "it is enough to find the angle which each rod makes with the horizon, and we can then deduce the true inclination."

Thus agreed, they proceeded with their observations, employing their spirit-level, and testing every result by the vernier. As Palander was about to inscribe the record, Strux requested that the level should be reversed, in order that by the division of the two registers a closer approximation to truth might be attained. This mode of double observation was continued throughout the operations.

Two important points were now ob-

tained: the direction of the rod with regard to the base, and the angle which it made with the horizon. The results were inscribed in two registers, and signed by the members of the Commission.

There were still two further observations, no less important, to be made: the variation of the rod caused by differences of temperature, and the exact distance measured by it. The former was easily determined by comparing the difference in length between the platinum and copper rods. The microscope gave the variation of the platinum, and this was entered in the double register, to be afterward reduced to 16° Centigrade.

They had now to observe the distance actually measured. To obtain this result, it was necessary to place the second rod at the end of the first, leaving a small space between them. When the second rod was adjusted with the same care as the former, it only remained to measure the interval between the two. A small plate of platinum, known as a slider, was attached to the end of the platinum bar that was not covered by the copper, and this Colonel Everest slipped gently along until it touched the next rod. The slider was marked off into 10,000ths of a toise, and as a vernier with its microscope gave the 100,000ths, the space could be very accurately determined. The result was immediately registered.

Michael Zorn, considering that the covered platinum might be sooner affected by heat than the uncovered copper, suggested another precaution; accordingly they erected a small awning to protect the rod from the sun's rays.

For more than a month were these minutiæ patiently carried on. As soon as four bars were adjusted, and the requisite observations complete, the last of the rods was carried to the front. It was impossible to measure more than 220 to 230 toises a day, and sometimes, when wind was violent, operations were altogether suspended.

Every evening, about three-quarters of an hour before it became too dark to read the verniers, they left off work, after taking various anxious precautions. They brought forward temporarily the rod "No. 1," and marked the point of its termination. Here they made a hole, and drove in a stake with a leaden plate attached. They then replaced "No. 1" in its original position, after observing the inclination, the thermometric variation, and the direction. They noted the prolongation measured by rod "No. 4," and then, with a plumb-line touching the foremost end of rod "No. 1," they made a mark on the leaden plate. They carefully traced through this point two lines at right angles, one signifying the base, the other the perpendicular. The plate was then covered with a wooden lid, the hole filled in, and the stake left buried till the morning. Thus, if any accident had occurred to their apparatus during the night they would not be obliged to begin afresh. The next day, the plate was uncovered, and rod "No. 1" replaced in the same position as on the evening before, by means of the plumb-line, whose point ought to fall exactly on the point intersected by two straight lines.

These operations were carried on for thirty-eight days along the plain, and every figure was registered doubly, and verified, compared, and approved, by each member of the Commission.

Few discussions arose between Colonel Everest and his Russian colleague; and if sometimes the smallest fraction of a toise gave occasion for some polite cavilings, they always yielded to the opinion of the majority. One question alone called for the intervention of Sir John Murray. This was about the length of the base. It was certain that the

longer the base, the easier would be the measurement of the opposite angle. Colonel Everest proposed 6,000 toises, nearly the same as the base measured at Melun; but Matthew Strux wished that it should be 10,000 toises, since the ground permitted. Colonel Everest, however, remained firm, and Strux seemed equally determined not to yield. After a few plausible arguments, personalities began: they were no longer two astronomers, but an Englishman and a Russian. Happily the debate was interrupted by some days of bad weather, which allowed their tempers to cool. It was subsequently decided by the majority that they should "split the difference," and assign 8,000 toises as the measurement of the base. The work was at length completed. Any error which occurred, in spite of their extreme precision, might be afterward corrected by measuring a new base from the northern extremity of the meridian.

The base measured exactly 8037.75 toises.

And upon this they were now to start their series of triangles.

End of Part I

Jules Verne

The author of "Measuring a Meridian" won an enduring fame for his stories devoted to science fiction. He was among the first writers in this field, and gave it a dignity by the length of his narrations as well as by their scientific basis. He was born February 8, 1828, in the city of Nantes, where his memory is preserved as one of the glories of the quiet little Breton City. He went to Paris to study law, but his genius for literature appeared in the writing of librettos for two operas when he was about twenty years old, and a couple of years later he collaborated with the younger Dumas on a comedy in verse. He wrote some stories of traveling adventure and these started him on his career. He is considered a pioneer in fiction travel stories. His science fiction story "Five Weeks in a Balloon" is considered his first success in this type of romance. It appeared in 1862. He made his home in Amiens, where he died on March 24, 1905. The love motif was kept under successfully in his works. It may be noted that our readers sometimes made their protest against this topic appearing in our stories.

He was a Member of the Legion of Honor, and several of his works were crowned by the French Academy. It is interesting to realize that while he was writing, the greatest developments in science and engineering were at their heights.

His monument, emblem of his immortality, is depicted on our cover.

In the Realm of Books

"F.P.1 Does Not Reply," by Kurt Sodmak. Translated from the German by H. W. Farrel. Published by Little, Brown & Co., 290 pages, $2.00.

There seems to be a decided depression in science fiction also. Only one book really worth considering has come out, the English version of "F.P.1 Does Not Reply".

This is the book from which the film "F.P.1" was made which I reviewed in our February issue. The book is a very interesting technical romance, describing in great detail the construction of the first Floating Platform. Said Platform is to be anchored in mid-Atlantic between Bermuda and the Azores, and it is designed as a combination airport—hotel—restaurant—fuel station—repair shop, in other words, a floating "Tempelhofer Field." There is plenty of excitement in the story—sabotage—fights—gassing of the entire crew and the rescue in the usual nick of time. The Platform is also saved from sinking, by the finding of the missing valve-parts, so that the pumps can eject the thousands of tons of water, which the saboteurs hoped would sink the Platform. There is also a sort of sketchy romance appearing in the story—the love of Bernhard Droste, the designer and Gisela Lennartz, the beautiful—(naturally) daughter of the ship builder.

I have one serious fault to find with the book: The action jumps from Bremen to the Platform and other places with disconcerting rapidity and disturbing frequency. This is the usual fault with German publications.

Nevertheless, "F.P.1" is worth while reading.

C. A. Brandt.

"The Last of the Japs and the Jews," by Solomon Cruso. Published by Herman W. Lefkowitz, Inc., 1123 Broadway, New York City, N. Y. 333 pages, $2.50.

The jacket was headlined:

"The earth in flames, 16 million Jews exterminated, 60 million Japs annihilated, 100 million Americans killed in action, America again a wilderness," and other lurid phrases. I expected a sort of novel of the future, but I found an incredible accumulation of utter nonsense, badly written at that. The book is totally without rhyme or reason.

C. A. Brandt.

Notes on Moving and Talking Pictures

Several years ago S. Fowler Wright wrote a book called "The Deluge" depicting the swift destruction and slow rebuilding of civilization. In the book the chief action takes place in England and it was strongly reminiscent of "The People of the Ruins" by Shanks and "The Doomsmen" by Sutphen. The book itself was not so very interesting. It was written in the Wells manner—yet it drags along, an unending mass of detail and ending practically nowhere, the feeble plot lying on the wayside from lack of momentum. In the visualization the feebleness of the plot is well sustained, but the change of scene from England to America is much to the better, since it is far more impressive to see New York devoured by a tidal wave than even the rapid inundation of an English countryside.

The destruction of New York is exceedingly well done, quite realistic and plausible and well worth the price of admission. Aside from this, the story winds up in a gang-fight, from which the better element emerges triumphant.

C. A. Brandt.

"The Invisible Man," by Herbert George Wells—adapted for the screen by R. C. Sherriff and produced by Universal.

Congratulations "Universal!" You have done well! No fault can be found with any and all the changes made in the story since the "end justifies the means," and "The Invisible Man" is as perfect a film as could be wished for.

Our readers are probably familiar with the story, but here is a short synopsis for those who are not.

A research chemist discovers a way of making himself invisible. Unable to discover ways and means of becoming visible again, he goes mad. He then decides to become Emperor of the World, institutes a reign of terror, but is finally killed by the authorities. The invisible man is depicted on the screen by Claude Rains, who plays a very difficult rôle, and whose face is visible only in the end as he is dying. The eerie atmosphere, which this film calls for, is excellently sustained throughout. The uncanniness of the various scenes is marvelously convincing, and the various humorous situations don't degenerate into slap-stick comedy. Mr. James Whale, who directed the picture, and his staff of technicians, who must have labored mightily to produce the "invisible" effects, have done a wonderful job.

C. A. Brandt.

DISCUSSIONS

In this department we shall discuss every month topics of interest to readers. The editors invite correspondence on all subjects directly or indirectly related to the stories appearing in this magazine. In case a special personal answer is required, a nominal fee of 25c to cover time and postage is required.

Enlightenment About Ants and Human Beings Asked for

Editor, AMAZING STORIES:

The cover of the March AMAZING STORIES was a masterpiece, Morey at his best. All of Morey's covers lately have been exceptionally good, keep up the good work, Morey.

The editorial was very good. Dr. Sloane's editorials are always interesting. His style is very good and I see no reasons why he shouldn't contribute a few stories to our mag. What about it, Ed?

Now for the stories: In "Peril Among the Drivers," the plot could not be exactly called hackneyed because I've read many a story dealing with ants, their life, etc., but never such a method of penetration to reach and observe them. One question I would like to ask: In comparison, which *ego* is larger, the human one or the insect one? If the human one is larger, how could it get into the small body of an insect? Or is it just a manifestation which animates inanimate bodies, which cannot be measured or judged in terrestrial standards of physical measurement? Please enlighten me.

Let me say in conclusion that the story was darn good, a combination of excellent writing with good science and plenty of action. Let's hear more from Bob Olsen.

"The Man Who Stopped the Earth" and "A Job of Blending" were both short and extremely good. A few short stories are always welcome, for they provide the much needed variety.

When I say variety I mean in contrast to the two gigantic serials running currently. I expect literally a perfect April issue with the two serials coming to bang-up conclusions.

The reprints are all welcome, except the first one which appeared before in an early issue of AMAZING STORIES. Now I have no enmity against that perfectly good story, except that it was printed before in A.S.

The reason why I dislike reprints that have appeared before in A.S. is because I save my copies, and I can easily dig up the number it appeared in and read the story if I so desire, so you see it's a waste of perfectly good reading space. Thank heavens all the other reprints didn't appear in "our" mag. Continue to follow this policy and you'll get my support.

The bit of information about the corona of the sun was very interesting, and hints about the latest science news, here and there, would be greatly appreciated.

Now for the kick: *Please* cut the edges of the pages even, it would certainly be a blessing if they were. It is really a job to turn from page to page.

Raymond Peel Mariella,
5873 Woodcrest Avenue,
Philadelphia, Penna.

(The question you ask in this letter about the personality of ants, if it is compared to that of human beings, is pretty nearly unanswerable. The *ego* is not a material entity as usually understood. The instincts of an ant seem to drive him to endless activity, but we do not believe that N.R.A. and other letters of the alphabet, backed up by the Federal Government, will ever make man proportionately as active as the ant.—EDITOR.)

An Encouraging Letter from An English Reader, Who Seems to Like Dr. Smith's Alleged Slang

Editor, AMAZING STORIES:

I feel I must write and congratulate Neil R. Jones upon his consistently entertaining and thought-provoking Professor Jameson series. All of them have been excellent, but *"Time's Mausoleum,"* in my opinion, outdid all the predecessors—not so much in scientific value but in the manner in which it was written. May your shadow never grow less, Mr. Jones.

By the way, what has happened to Leslie F. Stone these days? She wrote the story which I shall forever privately classify as a superb masterpiece—*"The Man Who Fought a Fly,"* since then I've seen nothing of her work. After such a gem in miniature I expected something else, but no! Come, come, Mr. Editor, where has she got to?

Doctor Smith is indeed refreshing in his *"Triplanetary"*—although so far I've only got to the end of Part II. One can rely on him for a relief from the only too frequent prosaic hero and villain—great young hero, dazzlingly beautiful wife, and bold, bad villain (proved completely mad in the finish, of course.) Thank goodness, the great Doctor provides, as ever, understandable and even lovable people, complete with slang—Oh, I forgot, that matter is closed isn't it? Not for worlds would I restart it!

"AMAZING" in its new jacket is certainly more convenient to handle, but, oh dear! the rough edges! Why not bring along one of Doctor Smith's zones of force and slice all the edges monthly *en masse?* I'm sure he'd oblige, if Doc Seaton isn't too busy thinking up some-

thing about triple cosmic calculus. However, the contents are all right so the edges can take care of themselves. Still, don't you think it *would* lend a better appearance?

Your cover drawings are A.1; Leo Morey seems to be rapidly approaching the skill of Messrs Wesso and Paul, about whom older readers rave. Perhaps, if said readers had the task to do themselves they'd say less and think more.

Well, all the best to the best paper in science-fiction.

John Russell Fearn,
226 Hornby Road,
Blackpool, Lancs.,
England.

(The Professor Jameson stories have certainly won considerable appreciation and Neil R. Jones, the author, deserves congratulations for what he has done. Leslie F. Stone will soon make her appearance on our pages. There is no danger of losing her from the list of those whom we consider our staff writers. The old size of AMAZING STORIES always seemed rather awkward and the vast majority of magazines now conform to ours in their format or size. A criticism from an author has a special value, and it is always of interest to see how our work affects our neighbors across the ocean.—EDITOR.)

A Letter from England—A Question About Correspondents of the Fair Sex

Editor, AMAZING STORIES:

There is no mistaking your exceptional magazine, with its latest cover—quite in keeping with the enthralling stories under it—and then the cover design is progressive as well, it is unique and very MODERN, and there is the secret of the success of your paper.

Should you have the opportunity to publish my name and address, somewhere in your columns, I should esteem it a great favor, as I would very much like to exchange ideas and views with readers on your side of the world. Needless to say, I shall be pleased to answer all letters—my age is 20 years and I occupy a position as clerk in wholesale Wine Merchants.

May I ask if you have many feminine readers, as very rarely do I see letters from the opposite sex in your columns and yet I feel sure that many are interested in progression as supported by your pages.

Wishing you every success.

G. E. Marshall,
32, Glenwood Road,
Hounslow, Middlesex,
England.

(We are glad to publish your appeal for correspondents in this country and hope it will bring results. We know we have feminine readers. We have received some most delightful letters from them and we shall never forget Miss Robb's quite charming controversy with Dr. Smith. We shall hope to hear further from the fair sex.—EDITOR.)

A Letter from an Australian Reader, Who Would Like to Have Some Correspondents

Editor, AMAZING STORIES:

Would you please intimate to the readers of your magazine, the fact that away in an outlandish part of Australia there is a young fellow who is just pining away for a few friends with whom he can discuss various problems in science and chemistry.

When I get talking "Space ships" and "Ray guns" etc., round these parts, my audience shakes its head knowingly and mutters its pity.

I do admit that every spare coin I get goes into scientific apparatus, so I suppose I must be a "Crank."

However, I know that somewhere there must be an understanding heart, perhaps there are several; if there are I would be more than delighted to correspond with them (either sex). I also want to tell you how much I appreciate your magazine, it is my one consolation.

L. G. Anderson, A. M. I. A. E.
Cobden, Victoria,
Australia.

(We think that this letter should produce results, as a correspondent in so distant a country would surely have most interesting topics for discussion with people of similar tastes. We are receiving a surprising number of letters from the Antipodes.—EDITOR.)

A Theory of Atomic Cohesion by One of Our Authors

Editor, AMAZING STORIES:

During recent years the classical theories regarding the structure of matter have been replaced by the atomic theories expounded by Heisenberg, A. H. Compton, Davisson and Germer, G. P. Thomson, Dempster, De Broglie, Schroedinger and others. These theories all agree in the general statement that the atom is composed of protons and electrons. The electron is really a particle of negative electricity rather than an electrified particle, and the proton a particle of positive electricity. The charge of the proton equals that of the electron, therefore the particles are held together by electrical forces.

How are these forces generated? That has always been the stumbling block, the unknown quantity in permitting us to progress beyond a certain point in our study of energy and matter. We do not know what electricity is but we know how it manifests itself. According to my theory, that part of the cosmic world which we might call the ether, for want of a better word, is an intensively charged magnetic field. How is it charged? That is another unknown quantity, but for our purpose let us assume that this is the case. Then into this powerful magnetic field radiation waves of energy are projected at high speed. What is

the result? These waves, through magnetic induction, become particles of negative and positive electricity which are actually the electrons and protons composing the atom; then these charges revolve around one another and we have an atom of hydrogen. Thus matter is born. Other combinations of electrons and protons give us other elements.

Therefore, for the creation of matter, two things must be available—a magnetic field and the movement of what we can call radiation waves across this field. The converse of this should then be true—when movement of matter through a magnetic field ceases, atoms will be annihilated. Therefore, as told in my story, were the earth to stop suddenly it would disintegrate instantly into insubstantial radiation.

Cosmic rays coming from the depths of interstellar space probably represent the conversion of matter into energy, hence they indicate that the material universe is continuously dissolving into radiation, as advanced by Jeans, or, according to Millikan's view, these rays are the evidence of the birth and growth of matter.

While I realize that professional physicists may smile with superior disdain at a theory such as this, can they disprove it?

Henry Kostkos,
253 Scotch Plains Ave.,
Westfield, N. J.

(We have published some very good material by the writer of this letter and now that so many scientists are engrossed in the study of the atom, we believe that Mr. Kostkos' theory will be found very interesting to our readers.—EDITOR.)

The Works of Artists Criticised and Compared

Editor, AMAZING STORIES:

I am simply delighted with the December issue of AMAZING STORIES. The stories were all fine works of fiction. I am very glad to see a story by Otis Adelbert Kline in our magazine. "Time's Mausoleum," by Neil R. Jones had fragments of nearly every story he has written, in it, which made it all the more interesting. All the stories demand a great deal of praise.

And now, to get down to the cover. Morey painted two of the most terrible covers I have ever seen, for the October and November issues. I thought he would never return to the old standard that he set in the winter of 1932 (incidentally the four best covers Morey ever painted for AMAZING STORIES were on the April, 1932, May, 1932, Winter, 1932 Quarterly, and the Spring-Summer, 1932 Quarterly), but when I saw the December, 1933, cover I knew that Morey was at last beginning to hit his old stride again. Please do not put Sigmond on the covers again, please don't put Paul on the covers again, *BUT, please put Wesso, the uncrowned king of Stf. artists, on the covers every other month*, and let Muller do some of the illustrations. Morey is doing very well at present, but the other artists mentioned will add variety.

Incidentally, Editor, what happened to our Quarterly? ? ? ? ? Huh? All right, don't shoot; I'll go back to my hole.

Bill Dressler,
1425 North Fifteenth St.,
Philadelphia, Pa.

(You should realize that in the design on our cover, more has to be thought of than the purely artistic element. They are designed to attract attention so that the features of them which you consider defective from the standpoint of art may be of value from the standpoint of attracting attention to the magazine. It is a long while since Mr. Wesso has done any work for us.—EDITOR.)

The Number of Stories We Have Published by Five Popular Authors

Editor, AMAZING STORIES:

I will start this letter off by complimenting Morey on his wonderful cover on this issue—December. I think Bob Olsen's story takes first place in this issue as far as I am concerned, with Neil R. Jones and Dr. M. J. Breuer taking second and third places. Why, oh why, can't we get a sequel to Williamson's "The Stone From the Green Star"? I'll keep yelling until we get it, or until I get so old that I can't hold this pen up any longer, so you might as well give it to us. The way I understood it, the story was supposed to have a sequel in the story, "A Vision of Futurity." Williamson is undoubtedly one of the greatest of science fiction authors alive. I noticed, in going through your magazine since I started reading it back in the days of Vol. 6, No. 7, 1931, which was October, that H. Vincent has had more stories published. He has had eight. With J. Lewis Burtt second with seven and Bob Olsen and Dr. Keller and Neil R. Jones with six apiece. Well, I will close, waiting patiently for the next issue.

Olon F. Wiggins,
2418 Stout Street,
Denver, Colorado.

(Of your letter we can only say that we regard it as very encouraging for the Editor, because on him falls the selection of authors and stories and while he wants to please the readers, he also wishes to keep the magazine up to a high standard of literature so you can see why such letters as yours are appreciated. —EDITOR.)

A Letter from a Ten-Year-Old Reader of AMAZING STORIES

Editor, AMAZING STORIES:

I am only 10 years old, but I have been reading AMAZING STORIES for quite a while. The first time was some old copy, the one with "The Stone from the Green Star," in it. Once

or twice the newsstand, that I get my reading material from, would have a copy and by harping on it someone might buy it for me.

Then in May, 1933, I started taking it regularly, until this summer we moved down to Cape Cod where they only had it once in a while. Here the drug store has all the good magazines.

Unlike other readers, I think the larger size was better. When you had the larger size, they put it where you could see it, now they put it down with the 5, 10 and 15 cent trash. Another thing, when in the larger size, it looked bigger; now people see stuff that is thinner, but the same width, selling for 10 cents and they think they aren't getting their money's worth.

Among the best stories in the last seven months were: "The Death Drum," by A. Hyatt Verrill, and "The Meteor-Men of Plaa," by Henry J. Kostkos.

Henry H. Cross,
21 Shepard Street,
Cambridge, Mass.

(This letter is quite a remarkable production for a boy of ten years of age. We have always been much interested in our juvenile readers and in an early issue we even printed the portrait of one, whom we supposed to be the youngest reader of the magazine. The stories you have picked out in your last paragraph deserve all you say about them.—EDITOR.)

A Nice Letter from a Nice Boy

Editor, AMAZING STORIES:

While only now a boy, in high school, I have been a reader of all scientific fiction magazines, ever since I've been old enough to understand and appreciate the smallest part of any of the stories. Although I did not start saving these magazines until recently, I am making up for this neglect, by buying back issues.

The stories in the fairly recent issues of your magazine that I like best are as follows:

1. The Meteor-Men of Plaa, by Henry Kostkos.
2. The Essence of Life, by F. Pragnell.
3. Children of the Great Magma, by Walter Kateley.
4. Theft of the Washington Monument, by Robert Arthur, Jr.
5. Into the Hydrosphere, by Neil R. Jones. Here I would ask a question: Have there been stories preceding this one, by the same author and the same characters? It seems as if I have read stories like this before.
6. The Whisper of Death, by Harl Vincent.
7. The Battery of Hate, by J. W. Campbell, Jr.
8. When the Universe Shrank, by J. L. Burtt.

In the Spring Quarterly, 1931, there was an excellent story by J. W. Campbell, that I consider one of his best: "Islands of Space."

Let's have more and more of Harl Vincent and J. W. Campbell, Jr.

Your magazines forever,
William Nelson,
Delavan, Wis.

(This is another letter from a very young reader and we must say that he has made a very good selection of the stories which he enjoyed. Your question about "Into the Hydrosphere" we answer in the affirmative. This is the fourth Jameson story.—EDITOR.)

A Short Letter from England, Where We Have Many Appreciative Friends

Editor, AMAZING STORIES:

I am a regular reader of your books, and I think they are swell, that is, of course, when I can get them. There are no shops near where I live that sell them, and I have to go around all the markets and second-hand bookshops till I can find them, and they're about six months old when I do finally get them. Now to come down to brass tacks

Could you find a reader to write to me; someone about my own age, 21, male or female, female preferred?

I have always wanted to write to you and thank you for the good work you are doing, but up to now I have always found something stopping me.

I work in the local railway and have been reading your books for the last three years, some of my friends are always pulling my leg about them, and the arguments last for hours. But I am slowly getting them round to my way of thinking.

Hoping to hear from you soon and wishing your magazine the very best of luck, I remain

James Clark,
15 College Avenue,
Droylsden, Manchester,
England.

(Have you ever tried to get AMAZING STORIES from the Woolworth Company? They supply them to English readers. We hope that your letter will get you a correspondent. There is quite a demand among our readers for what we may suppose to be kindred souls who will be ready to open correspondence with them, but we have never heard of the results of their requests.—EDITOR.)

An Interesting and Suggestive Letter

Editor, AMAZING STORIES:

This is the first time since the AMAZING STORIES Magazine came out, that I venture to express my feelings and emotions. What is the big idea of cutting down the size of our magazine and changing the title design to the common type title of the present issue? I needn't say more.

As to the stories, there's no doubt about them being some of the finest literature we can get, though I prefer the more down to earth

stories to the interplanetary, such as we used to have in the old issues, *i.e.*, "The Island of Dr. Moreau," "High Tension," "Mr. Fosdick" and "Hicks," and the detective stories. The other type of stories are too good and interesting for me to criticize. As to the illustrations, there is no doubt about Mr. Morey being an artist in its full sense, but why doesn't he try to make his drawings more clear and precise with more of the exact scientific appearance. Art is my trade, or profession, but I wouldn't criticize Mr. Morey's knowledge of art.

I missed quite a few of the numbers since they were stopped from coming into Canada, but now I have picked them right up again. I still possess about thirty back numbers, beginning with Vol. 1, No. 1, which I wouldn't part with for the world.

Well, here's hoping our magazine gets back to its original shape.

Victor Dell 'Angela,
322 Bathurst Street,
Toronto, Ontario, Canada.

(A good test of the value of a letter for our correspondence columns is when it suggests a course of action to the Editor. The interplanetary stories are great favorites with so many of our readers that we are really inclined to believe that we are favoring perhaps a majority by publishing the same. The stories you name are very good ones and you will find that in an early next issue there will be more of the type which you prefer. This will be after the two interplanetary stories are finished. We now have the Canada question settled, we believe, to the satisfaction of our Canadian readers.—EDITOR.)

An Old Time Science Fiction Organization Asks for Members

Editor, AMAZING STORIES:

Well, here we are. Or should I say here I am? Well, any way, here is what the hundreds of thousands of readers of Science-fiction have been waiting for. What! Wait, until I get to it.

I want to ask you Mr. Editor to please print this in your Discussions department.

Now, as to what I have for the readers. I am not going to use the hack works of: "Something new!" Or: "Something unique!!" For it is not! Mankind has had such things as the thing I am going to tell you about!

It is an organization for all the true lovers of Science-fiction. It is called: "The International Science-fiction Guild." Further: It has been in existence for over twenty-five years—under a different name up until 1928.

This is an organization that is as different from any other as this magazine is different from the general run of Western, Detective, and so-forth magazines.

To prove this rather "strange" statement: There is only one thing that you have to have to become a member of this organization. That is: *A love for science-fiction.*

That, and the person's name, complete address, sex, age, and the kind of Science-fiction he or she likes best. This and a three cent stamp to cover cost of mailing will make you a life member of this organization. Will bring you a complete detailed booklet giving full information about this organization. Will bring you a membership card. Will bring to you the full and beneficial help of this organization.

Send the above information to the undersigned *at once.*

To get what they want the readers and lovers of Science-fiction must organize.

Remember, write, and remember that this is a personal letter to each and every one of you as a reader of this magazine. We could not have sent each of you a personal letter on account of the cost of postage. And therefore we have taken this means to place this proposition before every reader of this magazine.

We thank you Mr. Editor.

And wish the very best of luck to your wonderful magazine!

Address all letters to—

Wilson Shepherd,
The International Science-fiction Guild
Oakman, Alabama.

(The organization to which this letter refers, we imagine is quite characteristic, being designed for lovers of science-fiction which now is attaining a wider and wider spread. We can only hope that this letter, which we take great pleasure in publishing, will go to increase the membership in your very interesting society.—EDITOR.)

An Admirer of Posi and Nega Would Like a Little More Science, But "Loves Them Still"

Editor, AMAZING STORIES:

I have been a constant reader of AMAZING STORIES since early 1928 and later of your sister magazine, "Wonder Stories."

So much that has appeared within our mag's pages has been of the very highest quality, and the gifted authors have well earned both respect for their knowledge and admiration for the way they have presented their various sciences.

The love life and adventures of Posi and Nega are quite a treat, and also original. Mr. Skidmore made these infinitesimals so human in their emotions and ambitions, and if Posi had "aired his knowledge" a little more, I would have been still more greatly delighted. However, he is such a dear little fellow, even though he does aim high, I would like to keep in touch with him and his proud little consort.

Wishing AMAZING STORIES to attain to still greater heights, I remain

Winifred Claire Eversleigh
P. O. Box 304,
Grand Central Annex,
New York City, N. Y.

(We thank you for this letter and we are sure that Mr. Skidmore will be delighted to see it. He has made a very picturesque presentation of the world of electrons and protons and managed to inspire the *dramatis personæ* with much human nature. We have certainly enjoyed reading them before they went to the printer.—EDITOR)

An Appreciation from a Reader Who Underestimates His Own Good Qualities

Editor, AMAZING STORIES:

I sure do hope two things in regard to this letter (it's my first, by the way). Number one is that you will print it, and the second is that you will soon print the Skylark stories. I have been an AMAZING STORIES reader for quite some time and I sure have enjoyed most of the stories immensely. I liked "Into the Hydrosphere," by Neil Jones, quite as well as any story that I have read lately and also enjoyed "The Tree Terror," "The Supermen," "The Theft of the Washington Monument," and the story, "When the Universe Shrank."

As for "The Diamond Lens," I thought it was terrible and would appreciate it very much if stories like that would be kept out of our magazine (may I call it OUR?).

I have just finished the January issue of our magazine (again?) and found it for the most part very good. I have taken immediate liking for "Triplanetary," by Edward Smith, and also will give Joe Skidmore a big hand for "The Adventures of Posi and Nega." To tell you the truth, I think that AMAZING STORIES could get along swell without stories like "The Alchemy of Ian Bjornsin" and "The Atom Smasher." "The Lost Language" was, in my opinion, good, but I would rather read stories about Interplanetary travel, so you see how I disagree with J. L. Burt, of Leland, Mississippi. Here's hoping to see my very humble and misspelled missive in a future issue of your most magnificent, wonderful magazine. (Hope you won't think it is all flattery because when Dad has a "flatery" or is it just flat, anyway it has to do with a car, he gets awfully mad.)

Van Smith,
76 Leland Ave.,
New Rochelle, N. Y.

P. S.—I will cheerfully answer any letters that kind-hearted readers will send me.

(This letter speaks for itself. An Editor is to be congratulated when he gets letters like this, especially when so large a portion of his correspondence is of this type and when the unfavorable criticisms are comparatively few. Sometimes in our modesty we feel that the writers of these letters are perhaps too indulgent. Our readers may be sure of one thing and that is that we have some excellent writers who do so much for us, that we always think of them as being staff-writers, although they have really no direct connection with the magazine whatever. Your tribute to your father's wrath when his car develops a flat tire is very amusing. One may wonder if he drove a car in the old days when tires lasted from 2000 to 3000 miles only.—EDITOR.)

Unknown Languages of Children

Editor, AMAZING STORIES:

I have just read "The Lost Language," by Dr. David H. Keller. It is an excellent story and one of the best he has ever written. I am moved to write you because of something I remembered while reading it. I looked back amongst my large collection of odd newspaper clippings and found a positive verification of this story.

In October, 1932, a letter was printed in the New York Sun, by Robert A. Nelson. It is so interesting that I will repeat it almost complete. Here it is:

"It so happens that I am one of twin brothers, 24 years old. As in the case of "A Twin" it is a matter of record in my family that when my brother and I first started to talk, and until we were well past six, we conversed with each other in a strange tongue of our own. My mother says that my elder brother, now thirty-two, was the only person who could understand our conversation. My father, who specializes in interpreting, was unable to relate our mysterious tongue to that of any other known language.

"I myself remember very well my conversing with my brother in our odd tongue, but I am unable to remember any specific words with the exception of two. They are 'Fi-Fee' (short i), and 'Fa-Fa' (short a), meaning respectively 'Frederick' and 'Robert.' When my brother and I were six years old, we started school. At that time our knowledge of English was very little, if any. However, after a year of schooling and association with other children, we finally discarded use of our strange tongue."

It appears that truth *is* stranger than fiction. I doubt if Dr. Keller would have dared to put all the details of that letter in his story. That would be stretching it too far. I wonder now if this is not one of the rare clues to the mystery of where the soul came from. Could this language be one carried over from a previous existence on another sphere or is it merely (!) inherited memory? Either one sounds impossible, yet—explain it any other way.

"Triplanetary" is starting off good.

Donald A. Wollheim,
801 West End Ave.,
New York City, N. Y.

(Years ago, exactly such a case of an unknown language used by brothers was told to us by a friend. The great pity in these cases, as in the one you cite, is that the written record of the language was not kept. You will find

"Triplanetary" is an excellent story as it develops.—EDITOR.)

A Canadian Who Enjoys Our Efforts and Wants to Have a Correspondence with Others on Science Fiction

Editor, AMAZING STORIES:

What! No letters in the Winter, 1933 Quarterly? If it had not been for this, it would have been a perfect issue. My opinion of the stories are as follows:

"The Second Deluge" by Garret P. Serviss was truly a masterpiece. Noah would have been surprised had he been on Cosmo Versal's Ark. There is a man in Washington who has built an Ark for the next flood which he expects soon. He won't have to wait much longer, if it rains here much more.

"A Winter Amid the Ice" by Jules Verne was good. Commander Byrd intends to explore the South Pole during the summer time. He would never think of doing it in the winter.

"The Menace" by Dr. Keller was by far the best of his stories. What is he going to do about the "Taine" stories now? Taine is now an old man. A story which never received its just due was "A Voice Across the Years" which appeared in the Winter, 1931 Quarterly.

I went into the library to get a couple of books on astronomy and physics, thinking that I could get some information, but, no—all I found in the books was what I had read some time in AMAZING STORIES

Jack De Pangher,
Sardis, B. C.
Canada.

P. S. Will someone write to me and discuss science fiction? I'll answer all letters.

(We have here another Canadian letter in which our magazine is treated very nicely. We are glad to read what you say about Dr. Keller. Our hope is that AMAZING STORIES will get better from year to year, but in spite of the efforts of our brain trusts in Washington, the business world is not picking up as fast as we would like it to. When one's whole heart is in the development of a subject the waiting for times to change is a very severe trial.—EDITOR.)

An Appreciation of AMAZING STORIES and Note of a Supposed Error in it from An English Reader

Editor, AMAZING STORIES:

I want to thank you for publishing my letter in the February issue, which I received four days ago.

Regarding the stories in the last four issues, they have all been good except for the two Poe reprints and the Verne reprint. I don't like these two authors myself and I would like to see rather more modern reprints, but still I don't want to try and force my opinion down your throat.

I expected a lot of Dr. E. E. Smith, after reading "Discussions" about him, and my expectations were realized to the fullest in "Triplanetary."

In the December issue, I was glad to see another Professor Jameson story and another story by Bob Olsen.

I was happy to see that two serials are now running in the magazine and both tip-toppers. In the January issue you said "Terror Out of Space" was by J. M. Walsh, but in the February issue it says "H. Haverstock Hill." Who is the author?

I obtained the Quarterly about a week ago. What I said before about Verne holds good for "A Winter Amid the Ice." I didn't like it. "The Second Deluge" was all I expected after reading letters about old stories. It's great. So is Doctor Keller's story "The Menace." Why only 128 pages and no "Discussions" in the Quarterly? It was too small for the price charged in this country.

I was glad to see the Talkie Reviews as well as the Book Reviews in the latest issue. I saw F. P. 1 about six months ago.

One of our English newspapers recently published a science-fiction story as a serial and I think this goes to show that this type of story is growing in popularity among the general public in this country and several authorities have said that space-flying is a possibility. Do you really disbelieve it is possible or is it an attempt to gain notoriety when it does come?

Yours until space-flying is a fact and after.

Philip S. Hetherington,
"Tycooly" Southwaite,
Carlisle, Cum., England.

(The two names you cite refer to the same person; one is a *nom de plume*. This has occasioned a slight confusion in your mind. In America a very great success has been attained by some novels of the same type as the stories which we publish, and it is interesting to find England following in our footsteps. Dr. Keller, the author of the "Menace" is a typical American, and is attaining a high reputation as a writer of stories. In writing for us, of course, he is supposed to give a scientific touch to them. To get stories of this type, we have found, is not an easy thing. In anything the writer of these lines may say about space-flying, or the expression of any views relating thereto, "notoriety" certainly does not enter into the calculation. There would be no glory in refusing to believe in space traveling and then to have someone go off and do it. Personally, we do not believe in its possibility.—EDITOR.)

A Very Pleasant Letter from An English Correspondent

Editor, AMAZING STORIES:

I first started reading A. S. when I picked up a copy in a second hand book store in Toronto, Canada, in October, 1927, when I emigrated to that country.

Since then I have taken such a liking to the old "Mag.," that after I left Canada where I ordered it regularly from a book store in Bay Street, Toronto, I have had it as regularly as possible, gradually building up a sequence of numbers. For you see, in this little "hick town" of ours it is only possible to get it occasionally from second hand book stores, and I usually leave off the reading of a serial until I have it complete.

I have before me now a copy of the Spring edition Quarterly of 1931 and the story that particularly took my fancy was "Moon People of Jupiter" Isaac R. Nathanson. Also I liked "Suicide Durkee's Last Ride," by Neil R. Jones in the September, 1932 issue.

I am afraid that is going back rather a long way, but that shows how up to date I am.

Say Ed., old chap, why can't youse ding-fuzzled guys put a few more pictures in the old book? It sure would be appreciated I guess, by heck it would. And what about some more interplanetary issues?

Being a bit of a thinker, none the less no scientist, mind you, but still keenly interested in Scientifiction, I have often wondered why, supposing we regard gravitation as a potential current of negative electricity attracting matter to earth, why cannot a ship be built to discharge a positive current at the earth thus reversing gravity's action, 'unlike poles repelling' you know.

Say Ed, if you print this letter, I wonder if any of your readers would care to send me some old quarterlies or monthlies in return for which I could send them some English "mags."

And say, do you think you could be a pal, a regular pal and send me some used American or foreign stamps? In return for which I will recommend your wonderful little "Mag" to all my book loving friends, and try and persuade them to place a regular order if you will tell me where to do so. Anyhow the "Mag." itself will do the recommending. Even now I have about 30 different copies which I regularly lend out. All for the good of the paper you know.

A reader for life
H. J. Marks,
22 Baker Street,
Ipswich,
Suffolk, England.

(It is interesting to note the fact that we get a number of letters from English readers and they always seem to like our work. The same applies to Australia, New Zealand and Canada as a rule, but the scoldings come from readers in this country. Letters like the above may be said to speak for themselves, but they certainly are a great pleasure, indicating that our efforts have really succeeded in eliciting results. It seems perfectly obvious that a trip of a quarter of a million miles through what is virtually airless space, and landing on an airless, waterless globe, with the great troubles of acceleration and deceleration, would try anybody's soul. And as regards interplanetary travel where distances are measured by light years, it seems preposterous to imagine that the events so picturesquely described in our stories will ever come to pass. Unlike poles do not repel—they attract each other. It is like poles which repel.—EDITOR.)

A Letter of Characteristic and Rather Personal Criticism

Editor, AMAZING STORIES:

The January and February issues of A. S. were excellent. The stories were very good. And I think the cover illustrations were very attractive.

There is just one thing I don't like and it is this. Why do you print those old stories by Wells, Poe, etc. I think the majority of readers of A. S. have read most of the stories by these men. I know I have. And if I should ever wish to read them again, all I have to do is go to the nearest library and read them free of charge. And still you waste valuable space and our money, by printing them.

And when we ask you in the most polite manner to reprint the "Skylark" stories you reply, "We don't make a practice of reprinting stories," or "We are not able to promise an early reprint" and then you turn about and contradict yourself by reprinting one of Poe's nightmares, which most of us can recite word for word by memory.

When I looked through the February issue and saw a story by Poe well that just spoiled my day. I started foaming at the mouth and I danced the newest version of the St. Vitus dance.

If you have so many stories on hand, then please print them.

The "Discussions" are very interesting, but lately it is getting a little stale. I don't mean the letters, I mean the Editor's answers. Please Mr. Editor think up some new excuses, those old ones are practically used up.

Well I think that is about all.

And don't try to give me any of your phony excuses. I've been reading AMAZING STORIES so long that I feel like some sort of an authority on A. S., so don't try to soft soap me.

Irving Rawson,
261 East 87th Street,
New York City, N. Y.

P. S.—No, I'm not one of the Boston Rawsons.

(We put this letter into our Discussions to show our readers what it is our fate to encounter in the way of severe criticism. There are a great many things which have to be considered in making up a magazine. We would suggest that you would show a higher literary appreciation if you would not call Poe's stories "nightmares." What you call excuses are not intended as such, you should consider them

simply statements of fact. The Editor's remarks on the letters are short and it would be a simple matter for the reader to pass them over and read the letters, which, in one sense or another, are always interesting. Comments on the letters are not excuses.—EDITOR.)

The Possibility of Going to the Moon. Bob Olsen and His Stories

Editor, AMAZING STORIES:

Once, many months ago I used to get a real thrill out of imagining a voyage to the moon. Slowly I began to believe such a thing possible, but now my hopes have been shattered on a cruel rock, Doctor Sloane, the ed. of A.S. has firmly denounced the possibility of such a trip. Alas I begin to reason with the Editor, why should man fail in the attempt to reach the moon? The old wail usually raised by a lot of sceptical people is, "it would take a terrific force of momentum to break loose from the Earth's gravitational force." When I go to cross the street do I give up in dismay because I can't cross the street with the speed of light? Of course not. I take my time and cross it at a fair rate of speed. Well, why can't a rocket ship or any other kind of a ship take its time for a little while until the gravitational force has been sufficiently outdistanced to allow a speed great enough to carry the ship to the moon? I ask you.

Please Doctor Sloane, don't pour any more cold water down our necks. If your opinion is that interplanetary travel is an impossibility you stick to it, but don't discourage us any more.

I am a lover of Bob Olsen's work. Please try and print at least one of his stories every month.

Fred Anger,
2700 Webster Street,
Berkeley, Calif.

(It is strange that a well meaning individual like the Editor of A.S. should not be allowed to make a statement as to his personal belief in the possibility or impossibility of going to the moon, without exciting what may almost be called indignation. Something over half a dozen adventurers have managed to get up to a height of a little over ten miles with ensuing death of three of them, and if stunt flights to one-twenty thousandth, the distance of the moon have produced such meager results, it does not look well for future travel to the probably almost airless satellite with its extremes of temperatures.—EDITOR.)

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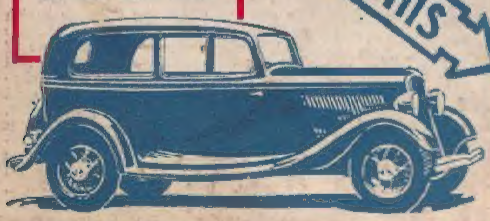

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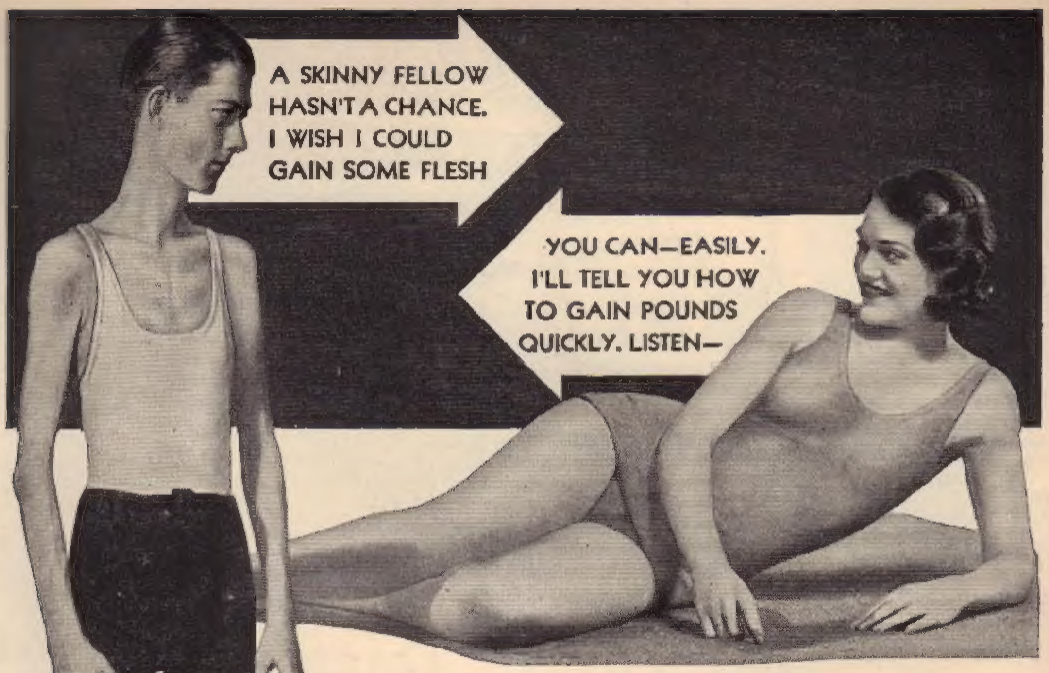

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